BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
November 14, 1957
and
November 15, 1957

IN THE MATTER OF:

CASE NO. 1327

TRANSCRIPT OF PROCEEDINGS

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3-6691 5-9546

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Cross-Examination by Mr. Ross Malor
Cross-Examination by Mr. Cooley
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ILLEGIBLE

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
November 14, 1957

IN THE MATTER OF CASE 1327:

Application of Texas Pacific Coal and Oil Company for an order immediately terminating gas prorationing in the Jalmat Gas Pool; or in the alternative, revising the Special Pool Rules for the Jalmat Gas Pool in Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order immediately terminating gas prorationing in the Jalmat Gas Pool, or in the alternative, an order immediately cancelling all accumulated underproduction and redistributing such underproduction to overproduced wells in the Jalmat Gas Pool, and requiring gas purchasers to nominate a sufficient amount of gas from the pool to permit wells from which purchasers are able to take gas to have an allowable equal to their actual production, and upon this basis to thereafter balance the pool production at the end of each proration period, and establishing deliverability of gas wells as a factor in the proration formula for the pool, and establishing a maximum amount of gas which may be taken from any well in the pool during a specified period of time. Applicant further requests the Commission to issue such further order or orders as will bring the pool immediately into balance and maintain such balance without waste and without abuse of applicant's or others' correlative rights.

BEFORE:

Honorable Edwin L. Mechem
Mr. A. L. Porter
Mr. Murray Morgan

TRANSCRIPT OF PROCEEDINGS

MR. PORTER: We will now take up Case #1327.

MR. COOLEY: Application of Texas Pacific Coal and Oil Company for an order immediately terminating gas prorationing in the Jalmat Gas Pool; or in the alternative, revising the Special Pool Rules for the Jalmat Gas Pool in Lea County, New Mexico.

MR. PORTER: Mr. Campbell, do you have some exhibits to post?

MR. CAMPBELL: Not at this time, unless somebody wants the exhibits that were posted the last time.

MR. COOLEY: I think the exhibits should be posted.

MR. CAMPBELL: All right.

MR. PORTER: We'll take a 5-minute break.

(Recess.)

MR. PORTER: The meeting will come to order. Mr. Campbell.

MR. CAMPBELL: If the Commission, please, at the last hearing on this matter, we stated we would have both witnesses available for cross-examination. Therefore, I would like to ask Mr. Frank Martin, who was our first witness, to take the witness stand for any cross-examination that anybody may have.

MR. PORTER: Anyone have a question of the witness?

MR. WEBB: Layton Webb, representing Sinclair.

FRANK MARTIN

recalled as a witness, having been previously sworn, testified as follows:

CROSS-EXAMINATION

BY MR. WEBB:

Q In reading your testimony, Mr. Martin, I believe you stated that during the first two years of proration from the Jalmat Pool, the pool was maintained essentially in balance, and that Texas Pacific's wells were being produced in line with the allowables, is that correct?

A I believe I made the statement that for two and a half years, the first two and a half years of proration, that the pool was maintained essentially in balance.

Q And that the last year and a half it had got out of balance to the detriment of Texas Pacific Coal and Oil Company?

A No, sir, I don't think I phrased it that way. I said the pool had gotten out of balance, and primarily during the last six months of '56, and tried to bring out that it was a thing common to all producers in the field. I think we used the number, 26 producers.

Q The fact that it was maintained in balance for a period of two and a half years after proration was started, would that indicate to you that it may not be the field rules in there that is causing the trouble, but the method at which the purchaser is producing the wells?

A Well, I think we brought out the fact that there was prob-

ably several things behind it; the failure to go past the balancing period was one of the contributing factors; that had the pool been balanced each six months, overproduction cancelled, and redistributed, that the overproduction would have been at least minimized.

Q If the purchaser had produced the weaker wells during the periods of lower take and demand and then called on the better wells during peak demand, wouldn't the field have been in a better shape now, even under the present rules?

A That would be a difficult question for me, not being an engineer to answer. It is based on the facts shown on our exhibit Number One. There was, I believe, 170 wells that were underproduced for the year 1956 at a time that the Jalmat Field was produced at it's heaviest withdrawal, 85 billion cubic feet of gas, so it would seem reasonable that any well that was underproduced during a year in which the field withdrawals were at an all-time high, there would hardly be much reason for it, other than inability to produce.

Q Are you familiar with the purchasers gathering systems in that field?

A Well, I wouldn't qualify as an expert in that category, no.

Q Are you basically familiar with them?

A Well, yes.

Q I'll ask you, if you know that the purchaser has a different pressure gathering system?

A That's right. I know they have a high pressure system, an intermediate.

Q Are you familiar with whether or not the intermediate system extends throughout the field?

A Well, I couldn't answer that. I'm not familiar with that.

Q Assuming that it does not extend throughout the field, but could be extended throughout the field, would that help those wells which are underproduced, to catch up and produce their allowable?

A Why, yes, I think it would logically follow that any well that couldn't back a 600-pound line wouldn't be materially helped; if it started bucking a hundred pound line with maybe compressor, it would certainly help it.

Q I don't recall whether it was you or Mr. Keller talking about reclassifying margin wells in the field. I believe you did, and perhaps he did too, is that correct?

A That's correct.

Q What would be your definition of the marginal well in the Jalmat Pool?

A Well, my definition would be just as stated in the regulation, that any well during any one month of a proration period produces an amount of gas equal to the allowable of any month in

the proration period, can not be classified as marginal. I think we pointed --

Q And, conversely, any well which could not produce it's allowable would be classified as marginal?

A That is true.

Q You would give no consideration to the pressure line?

A Well, sir, I wasn't giving any consideration to anything, I was quoting the regulation. The regulations state that is the way it will be determined. I think we brought out the fact that during a proration period, the first one in '57, that the allowable for a non-marginal well varied from a high of approximately 28 billion per unit, to a low of slightly over 8 billion, which meant that any well that could make 8 billion, as I understand it, could not be classified as marginal.

Q Just one further question, and I am repeating myself, since proration under the present rules did work at least reasonably good for at least two and a half years, then there is no reason to expect they will not work when the field is brought back in balance on the first of January of 1958, is there, assuming that the purchaser properly produces the wells in the field?

A Well, I think there's a number of reasons why it can not work perfectly. I think the main one is this, that in the year 1957, when the Jalmat Field has been cut back the first nine months,

it was cut back approximately 39 percent over the first withdrawals of 1956.

During that time of the cutback in '57, the main cutback has necessarily been in the wells that were overproduced as of the end of the year, and an attempt being made to get them back in balance.

Well, it would follow that when the wells were cut back that were over-produced, the other wells, the purchaser still having a market for gas, the other wells had an opportunity to produce a lot of gas.

In other words, these 170 wells were underproduced in 1957, had an opportunity this year to produce large quantities of gas, but they failed to do so. At the present time, as of September 30, there is in the Jalmat Pool an under-production of 10 billion cubic feet; it has been moving up at the rate of better than one billion cubic feet a month, although in the face of reduced production from the field of about 33 percent.

Q That opportunity to produce that you speak about is an opportunity to produce into the particular line to which that well is connected, is that correct?

A Yes.

Q You are not trying to say that each well in the field has an equal opportunity to produce?

A Well, I wouldn't say that, no.

Q Has had the equal opportunity?

A That's right.

MR. PORTER: Anyone else have a question?

MR. MALONE: If the Commission please, Ross Malone of Atwood and Malone, Roswell, New Mexico, appearing for Gulf. I would like to enter Mr. Kastler's appearance as co-counsel.

BY MR. MALONE:

Q Mr. Martin, the information that is included in Texas Pacific Exhibit Number One was compiled by you, or under your direction, was it not?

A That is true.

Q You have made a rather extensive study of the condition which now exists as regards the prorationing of gas in this field?

A That is correct.

Q Are you recommending to the Commission at this time on the basis of that study, that an order be entered terminating gas prorationing in Jalmat?

A That is the way our application is styled, and then we had as an alternative, other --

Q Your application is in the alternative, I believe, that the prorationing be terminated, or that some other action be taken?

A Yes.

Q My question is whether or not it is your feeling on the

basis of the study that you have made, that we are dealing with such an impossible situation that the Commission should stop proration of gas entirely, or whether there are other alternatives that you feel are available?

A No, I think the reason for requesting termination of gas prorationing in the Jalmat Field Pool would center primarily on the fact, that for all practical purposes we have only one purchaser. It is my understanding that the necessity of proration is predominantly necessary when you have several purchasers in the field to see that you have ratable take and that your correlative rights are protected; but when it gets down to one purchaser primarily with 85 percent in excess of the connections, we fail to see the necessity of it.

Q You are aware of the fact that the New Mexico Act does not limit gas prorationing to pools in which there is more than one purchaser?

A That is true.

Q You heard Mr. Nutter's testimony this morning, that the ability of the wells to produce from the Jalmat Field was in excess of market demand; do you disagree with that testimony?

A No, sir.

Q Then the conclusion would be, would it not, that you feel that under the statute, gas prorationing in Jalmat is justified

and should be continued, but that something needs to be done about it?

A Well, naturally, if everything was rocking along, and the fields being kept in balance, and the purchaser had the right, had the market for gas, and the rules were set up to where he could get the gas, obtained it when he needed it, then there wouldn't be any occasion for anybody discussing the matter.

But this thing has gotten out of balance when it is necessary to curtail the field to the extent of 30 some percent one year to the next, when the purchaser still has a market, as so stated, but due to the regulations, the failure to cancel the under-production and reclassify wells marginal, has pyramided the thing over a period of years to where that it has got to the point that at the end of 1956 it was rather impossible.

Q Well, my question then is whether in the light of that situation, it is your conclusion and recommendation to the Commission that they abandon the prorationing of gas in Jalmat at the present time?

A I think that could easily be done in Jalmat, due to the fact, as previously stated, primarily one purchaser.

Q Is it your opinion it should be done at this time?

A Yes, sir.

Q So that you do not support the alternative suggestion of

Mr. Keller as another means of taking care of the situation?

A I don't believe you could draw that conclusion by the statement I just made there. You know if we didn't feel there was more than one approach to this issue, we would come in here and ask for the termination of prorationing period.

Q The basis of my question was that Texas Pacific's application was in the alternative, and I was trying to determine which way they wanted to go. I gather from your question that you are not taking the position as to which way you should go, but you are just calling the whole thing to the Commission's attention?

A That is primarily it. Texas Pacific in this case, one thing we tried to point out, not from the standpoint of Texas Pacific Coal and Oil Company, that is one of our motives naturally, we are trying to bring out that this condition exists for all operators.

We are not the one that is most over-produced, and other operators, large companies, are in the same category, and we think that everyone needs help so that when we have this investment in these wells, and we can't sell oil now due to the curtailment, that we need to sell some gas. We would like to get it where the purchaser has a market, that we could sell it to them.

Q So, as far as you are concerned, it can be sold either without prorationing, or under a different formula?

A That's right. I think it gets back to where the gas is in the ground, and the purchaser has a market, and all we need to do is get some means devised where it would be legal to do it.

Q The condition that you found that has brought about this very serious situation, you said resulted in part at least from unrealistic nominations by the purchasers, I believe?

A I think we're getting the word "unrealistic" -- I made the statement to this extent that failure of the purchaser during the last six months of 1956 to keep nominations in line with actual production as had previously been done aggravated the over-produced status as of December 31st. It is a well known fact to us that failure to keep nominations in line with production during the first four months of a proration period, is eliminated by the two months' adjustment --

Q Surely.

A -- but it does mean, and shows definitely, that in the last two months of a period, any large discrepancy and any over-production, can produce an over-produced status and a picture that is not realistic at the end of the prorationing period.

It can cause your well to show 100 million over-produced, and has only six months to straighten it up. Whereas, if the nomination and the production the last two months of the preceding period had been kept in balance, or as closely as possible, this

100 million overproduction might be a lesser figure.

Q I am perfectly willing to accept your phrase of unrealistic nominations to describe that position. You still like it, or are you going to abandon it?

A You heard the explanation of the phrase; you can take your choice.

Q It is true though, that for a period of two and a half years, whatever the problems of production were, they seemed to be pretty well solved so that the pool stayed in balance?

A That's right.

Q Do you have any reason to believe that you have any condition, or any condition that occurred later, and hence was handled by nomination?

A We made a rather extensive study of it, and as of right now, I can't tell you of any condition that existed in 1956 that didn't exist prior to '56.

Q So you do feel that the fact that the system was in operation for two and a half years might be some evidence of the fact it might continue to operate?

A I think that is true.

Q If we could assume that the purchasers were going back to the realistic basis of nomination which they had during the first two and a half years, we might eliminate at least this part of the

problem?

A To a certain extent. One thing I want to call to your attention again is the fact that on an acreage basis where that allowable is spread across the field on strictly acres, 160 acres constituting a unit, the best wells in the field receiving, for example, 20 million allowable for the month, the well with the least productivity in the field an equal one, you come up after a period of time and it happens pretty quick as the field declines, it is going to be more evident.

It is like Exhibit One shows, that there with 170 wells that didn't produce enough. This year in June the over-production, as I recall it, 7 billion in the three months July, August, September; not over-production, under-production, 7 billion in the three months following July, August, and September. As of September 30th, it now stands at 10 billion, so that it shows one thing, that in that field there is a lot of wells that even during 3-months of curtailed production, July, August and September, these wells still couldn't make anything like the allowables that were granted to them -- for what reasons? Well that's, line pressures are too high, that is something else, but realistically they are not making the allowables granted to them on an acreage basis.

Q When connected to the present pressure line?

A Yes, sir.

Q Now, with reference to the reclassification of marginal wells, which I believe you said was in your opinion another reason that we have gotten into this jackpot, you said, I believe, that there would actually be two benefits to reclassifying marginal wells: One would be the cancellation and reallocation of under-production, and the other would be that future allocations would be made only to the non-marginal wells?

A That's right. Of course, the marginal wells would receive a marginal allowable, and the remainder would go to the remaining non-marginal wells.

Q The two benefits from that action would help to clear up the situation that is plaguing us now?

A Materially.

Q And that could be accomplished by the cooperation of the producers and the purchasers and the Commission, couldn't it?

A That is true; it comes back to another category of realistically keeping nominations in line with production during 1957. These two months when the alternate allowable was granted, a non-marginal well got down to a point of slightly in excess of 8 million. That was brought about by one reason, the nomination for the month of July by the purchasers, for which they had a market, was reduced drastically by the under-production of two months prior, to where the final allocation allowable to a non-marginal

well got down to a point of slightly over 8 million -- that means that every well that could make 8 million in that field, could not be classified non-marginal.

Q If we assume that the Commission is going to take the necessary action to make that reclassification, we are going to have this part of the problem at least taken care of, aren't we?

A That is true.

Q I believe another factor that you said contributed to the present difficulty, was the situation with reference to the wells that were connected to the Permian system, and the fact that their market did not develop as they had anticipated that it would?

A I don't know as I went that far on my testimony. I was trying to bring out that Permian is not a factor as a purchaser to any extent in the Jalmat Pool. As previously stated, El Paso buying 85 percent plus Phillips, and Southern Union, various ones buying 5 percent, to where Permian has connections only equal to 10 percent of the field.

Q It is true, if Permian was unable to take the allowable from the well to which it is connected, it would contribute to this under-production situation?

A That is true.

Q If the Permian's situation has changed to the point where that no longer will exist, we will have that factor eliminated?

A That's right, that will help.

Q Well, with the Permian situation eliminated by the reclassifying of the marginal wells, we will have the dual benefit that could come from that?

A Yes.

Q If the purchasers could come back to the basis of realistic nomination they used for two and a half years, we would be in the situation where we would have eliminated all the problems that have contributed to our situation?

A That is right, with the one exception we will not. Straight acreage basis granting allowables greatly in excess of their ability to produce.

Q You are not testifying as an engineer?

A No, strictly as a mathematician.

Q You don't want to testify as to deliverability as a factor?

A No, I am just saying as straight acreage basis, putting 20 over here, and 20 over here, one won't do it, something has to happen.

Q Now, is it your judgment that the best way to eliminate this final problem you mentioned, is to go over to a deliverability basis, or to abolish prorationing entirely?

A I would like to answer this question this way: That we have an expert engineer, a witness in this case, and I would be

glad to have him take up that phase. I think it is quite out of my category.

Q Would you like then to retract your statement that that is a factor on which you want to testify?

A No, sir. What I said was, the statement I made was strictly a matter of mathematics. The engineering phase would have to be taken up by the engineer.

Q You found the figures there, but you don't know quite what caused them?

A Well, that is true.

Q There was, I believe, some testimony in connection with one of your exhibits, as to some out-of-range meter charts that were introduced in evidence. Do you recall that exhibit?

A I do.

Q Do you happen to know what size orifice plates were used in those meters?

A Not in those particular instances. The examination disclosed that the maximum orifice plate had not been installed.

Q If a larger orifice plate had been used, it is a possibility the meters would not have out-ranged themselves?

A That is quite true. It would have had a good chance of containing them in the chart range.

Q We can't draw any conclusions from that particular exhibit?

A No, sir. When it gets out of range, it is anybody's guess as to what happened. All we know is that the maximum size orifice plate was not in the line.

Q And the maximum size would have reduced the ranging of the meter?

A That is right.

Q It is true when that occurs that an effort is made to estimate the gas that has gone through that meter, and payment is made on the basis of that estimate?

A If that is true, I know nothing of it. Those things are figured by the integrator machine. The integrator follows a chart range, if it is in excess of the chart.

Q You don't know whether that is the practice?

A Well, as far as Texas Pacific Coal and Oil Company, we have never been able to detect anything like that. We are always paid for whatever the integrator reading shows, which is limited to the range of the chart.

Q Would you agree with me then, by way of summary, Mr. Martin, that these factors which you have mentioned are all subject to correction, and do not necessarily indicate that gas prorationing should be abandoned in Jalmat?

A Oh, I think the factors we have been discussing could be corrected without abandonment of prorationing. I do say that the

thing is, so many of the wells will not make the allowable. As long as we stay on the acreage basis we are in trouble, and since we have only one purchaser, it would seem rather realistic that that purchaser could market that gas without prorationing. If he nominates before this Commission for 10 billion cubic feet, and the Commission thinks that is less than the capacity of the field and grants it, it would be his prerogative to take it ratably.

Q But, if under the Statute, the Commission is required to pro-rate the field, you feel that these problems are subject to correction?

A I do.

MR. MALONE: That's all.

MR. PORTER: Mr. Cooley.

BY MR. COOLEY:

Q Mr. Martin, you have just stated that you feel one of the major deficiencies in our present gas proration system is that under the straight acreage allocation, you have a great many wells that can not make it's allowable as assigned on the straight acreage basis?

A That's right.

Q If a well can not make it's allowable consistently, as you stated in your definition a moment ago, that well is a marginal well?

A With this exception, the fact that the wide fluctuation between what would constitute a marginal well; in other words, the first six months of 1957 when the amount of allowable allocated for a month fluctuated from 2# plus million per unit in February, to in July slightly over #, any well in the field that would make # could not be classified a marginal well.

In other words, what we're saying that that would be taken care of on any other formula.

Q But, if you and Mr. Malone are successful in curing all the ills just mentioned, one of them being unrealistic nominations, that wouldn't occur again, would it?

A No, sir.

Q Then, a well which was consistently assigned more allowable than it could make, would be classified as marginal well, would it not?

A That's right.

Q What would happen to the allowable which it couldn't make, where would it be assigned?

A It would be assigned to non-margiral.

Q Which were capable of producing?

A It would greatly alleviate the problem.

Q Wouldn't that also materially aid the situation?

A Definitely.

MR. PORTER: Anyone else have a question of Mr. Martin?

MR. SELLINGER: May I ask Mr. Martin a question or two?

BY MR. SELLINGER:

Q I believe in answer to a question by Sinclair's attorney, you stated that you had no explanation as to why the field was in balance the first two and a half years, and by the latter part of '56 and the early part of '57, was so badly out of balance; I believe you said you had no explanation?

A As to why during the latter part of '56, it was so badly out of balance --

Q You have no explanation?

A No.

Q Can you tell this Commission when the balancing was taken off from the Field?

A In Jalmat, there has never been a balancing period since the inception of proration, other than one time in '55, I believe it was that time that it was reduced a little over 7 billion, I believe, in January, and restored in February.

Q Are you familiar with the Commission's Order R-836 which took off balancing in the Jalmat Field for a period of one year, beginning July 1st, 1956?

A Yes.

Q Could that be an explanation as to why the field was in

balance prior to July 1st,1956, and why it was not after July 1st, 1956?

A That might be part of it. The fact that the nominations in production were not kept as close as they had been in the past is only part of it.

Q But, by the failure to balance production, you carry forward underage, do you not?

A That's right.

Q And do you know how much underage was accumulated to the Jalmat Field, as of July 1st, 1956?

A July 1st, 1956?

Q I believe --

A I can tell you.

Q Would it be on your exhibit, Mr. Martin, up there?

A Yes, it is on that exhibit. I can get it better there, I guess. July 1st, 1956, the pool as of July 1st, 1956 for all practical purposes was in balance, because this doesn't show the under-production for the pool as a whole. In other words, at the end of 1955, the under-production was 13 billion, nearly 14, 13,910.

Q As of that date, if the balancing had been permitted to go forward, would not the underage have been cancelled, and the Field placed in balance?

A That's right, and in some previous testimony we show that

there is approximately 6 billion cubic feet in the Field which is still in there, that had the balancing period not been waived, would have been cancelled as of June 30th, this year.

Q So that if you had balancing as of January 1st, as of July 1st, 1956, as of January 1st, 1957, and as of July 1st, 1957, you would not have the Field quite so much out of balance, would you?

A That is true.

MR. SELLINGER: That's all I have.

MR. PORTER: Mr. Cooley.

BY MR. COOLEY:

Q Mr. Martin, to continue with this line of questioning, started by Mr. Sellinger, I think it is probably true as you stated, if balancing had not been suspended --

A Yes.

Q -- the condition would not probably be as grave as it is now?

A That is true.

Q But the evil was not the failure in not balancing the field that caused the imbalance, was it, Mr. Martin?

A I think that was part of it.

Q How could it have been, since there never was any balancing in the Jalmat Pool?

A Because it is an accumulation of errors.

Q There weren't any errors for two and a half years, you just testified to that.

A Yes, but you have to give effect to the fact that production has been increasing withdrawals out of the field; after you start withdrawing above the given rate, and as the field declines, there is natural lag to the production.

Q The balancing might have caused the evil, but the failure to balance did not cause the evil?

A It would aggravate it. There are 6 billion feet of underproduction in the field right now that had the rules gone on without any passing of the balancing period --

Q It would have corrected that?

A That's right.

Q But for two and a half years the rules worked perfectly, or as nearly so as possible without any balancing taking place, even though the rules provided for it, and the only point I'm trying to make is the unbalance was not caused by failure to cancel and redistribute; it might have cured the evil, but it didn't cause it?

A No, it didn't cause it. What caused it was the inability of some wells, although two and a half years prior the pool as a whole was kept in balance, where you have 300 wells in there, you

have to get back and look at this thing from an individual well status, although the pool can be in balance, like June 1st there, June 30th this year, the pool as you look at it is in balance, but there is 7 billion over-production, 7 billion over-production so get back to an individual well status is where you got into trouble. The wells are subject to being shut in for over-production on an individual well basis. The pool as a whole can be in balance.

Q Now, let's assume for a moment that prorationing were abandoned in the Jalmat Pool. You say that since we have one purchaser and ratable take provisions in the Statute, that we would have adequate protection. Now, would ratable take, as you understand that term, require that a well which had over-produced or had produced more than other wells in the pool, would have to be curtailed to allow those wells to catch up?

A Mr. Cooley, if you will permit, personally, I believe that is more of a legal question. I would like Mr. Campbell to answer that.

Q You stated Mr. Martin that you felt, in your testimony a few moments ago, that there was really no reason for prorationing since we had one purchaser and ratable take provisions in the Statute which would give us adequate protection.

I don't believe this is if at all a legal concept certainly not too complicated, and certainly tied in to what you are testify-

ing about. If you are going to have any sort of fair withdrawal, we'll remove the use of the ratable take, just a fair and equitable withdrawal from the pool, if one well produces an unfair amount, would it not then be necessary to restrict the production or curtail the production from that well to allow the other wells to catch up?

A That is true.

Q That is the same problem we have now.

A That is the purchasers responsibility.

Q We have a lot of wells that have apparently produced more than their share, and we are trying to hold them down so the rest can catch up?

A I don't agree. Certain wells produce more than their share. I think there are certain wells as in all fields that have more deliverability, use the term, or more ability to produce, and on a straight acreage basis they are not being granted allowables that will let them produce it, because the allowables are being distributed equally to wells that have no chance to produce it.

Q What are the ranges there, what is the greatest range from under-production? What is the most under-produced and what is the most over-produced, if you can pick that out?

A Well, we summarized this from a pool status. I know of

some quarter unit wells for instance that are over-produced today; quarter unit wells, two of them I have in mind in the Jalmat, over-produced 100 million cubic feet of gas as of September 30th. It will take 22 months for one, between 22 and 21 months if shut in to get them back in balance on present allowables.

Q Do you feel, Mr. Martin, that every operator should have a fair opportunity to withdraw the gas which lies under his tract?

A Certainly.

Q Do you feel that these wells to which you have just referred have that much more potential, that much more gas under their property than the under-produced wells?

A No.

Q Then their wells have produced more than their fair share?

A These particular small units, but the pool as a whole, the reason we had an over-production as of the end of 1956 was because the purchaser had a market, he went into the field pool to get the gas, and he had only one alternative and that was to turn on the wells and he turned them all on apparently, because they so stated they had a market for every foot of gas they could purchase, and in so doing, naturally they produced more from the better wells, and with equal opportunity the less productive wells fell behind.

Q But what we're getting at is: What is the man's fair share of gas, and you agree that is the amount of gas that is under his

property?

A Yes, sir.

Q Anybody that has produced more than the amount of gas under his property, is producing more than his fair share then?

A I wouldn't say. I would think that the man that has produced more than -- at a particular time, more than the allowable, that has been granted is probably producing his share of the reserves.

Q You think he is drawing his pressures down to the extent that he is just producing next year's gas?

A No, I don't think that.

Q He is drawing his offsetting wells' pressure down too?

A I don't think that. I think when the pool as a whole was opened up, and they wanted all the gas they could draw from it, and they wanted the equal opportunity, the wells that produced most had to have the most reserves, or they would have been in the category --

Q There are a lot of reasons why a well would have higher deliverability. Again, you are not an engineering witness, and we won't get into that.

A I'm glad to hear you say that.

Q You will agree that, take the theoretical situation where a well is producing more than the amount of gas under that tract on which it is situated, is producing more than it's fair share of

it's gas in the pool?

A I would say that everything being equal, the line pressure equal, and two wells here and one produces a great deal more, and the other one for some reason is shut in, that certainly is not fair.

Q Any time he produces more than the gas under his tract, he is producing more than his fair share?

A Certainly.

BY MR. SELLINGER:

Q I would like to ask Mr. Martin, I call your attention to your Exhibits 3, 4, and 5, from which you testified, are all three of those wells connected to one common purchaser?

A That is true.

Q They are all top allowable wells obviously, since they are over-produced?

A Yes, they are good wells. They are in the 165 wells that produced in excess of the allowables during 1956.

Q And all three wells have the same allowables, since they have the same size unit?

A That's right.

Q Have all three produced the same volume of gas?

A No; there's not too much variation in them. There is a variation between the most they have produced, but over the long

period, they are pretty close.

Q Would you say over-production of one well of 72 million, and one of 121 million is substantially the same amount of gas produced?

A I think you are pinning that down to a period of a few months there.

Q No, I'm pinning it down to the year 1956, and the first six months of '57.

A Well, as pointed out in Exhibit 4, Texas Pacific's well there, you notice, was brought back down into balance pretty well until the month of June, and then a heavy withdrawal was made from that well, so that is the reason it is back up in the condition it is in. Had the withdrawal been made in the month of July, the different balancing period, it would have been in line with the other two wells.

Q I am talking about actual production for the 18 months that you have depicted on each of your exhibits, each of these three wells have produced different amounts --

A That is true.

Q -- and they yet have the same allowable. Do you think that the one who has produced the most production, with the same allowable as compared to the other wells, should be cut back to produce the same production given by the same allowables?

A Well, I think you have to look at the thing since the inception of proration. It is possible that one of the wells has produced more; as it is shown there, they came into the picture a little different, one completely in balance, and one over-produced.

Q Let's confine it to the period that you have on your exhibit. You have indicated the allowable; you have indicated the production; you have indicated the excess, you total it for the year 1956, and you total it for the half year '57. I'm just inquiring as to that period of time that you have depicted on your exhibits, not from inception, but during that period of time in which you say the field is out of kilter. You have three wells, top allowable wells with the same allowable, yet the total production from each of these three wells are different. Do you have any explanation as to that?

A I don't think there is an explanation. On our Exhibit Number 1, we show by producers there is a wide variation in the over-produced wells, ranging from an average of 269 million up to 356 million.

Q That is your Exhibit 1? Let's go back to 3, 4, and 5, why did you depict those three wells?

A As stated previously in the testimony, those are not the top wells as to over-production, nor are they the low ones. They are the number of wells in the category that are over-produced to

a greater extent, and a lot of them to a lesser extent. The average over-all was 304 million.

Q What is the average of those wells? Let's take Exhibits 3, 4, and 5. All I'm attempting to ask you with respect to those three top allowable wells, who have the same allowable yet have different production over that period of time, I just want to know what explanation you have as to why these wells produced different amounts under the same allowable?

A Well, I think I can answer that very simply, I can't give you any reason for it.

MR. SELINGER: That's all I have. Thank you.

MR. PORTER: Anyone else have a question of Mr. Martin? The witness may be excused.

MR. COOLEY: Just a moment, I think I have one more question.

BY MR. COOLEY:

Q Mr. Martin, we have a telegram from the Ohio Oil Company which states in essence they feel that you misstated the status of their 600-acre unit in the Jalmat Gas Pool as of June 1, 1957. They have here --

A June 30th.

Q I believe your testimony was as of June 30th.

A Yes, sir.

Q Apparently, the figures referred to, which was 356 million

over-produced, apparently the figures referred to was total over-production of the Ohio 600-acre unit, as of June 1, 1957, shown by official proration schedule to be 356.03 M.C.F. The Ohio requests that the official proration schedule for the Jalmat be incorporated by reference in the record of this case. We have examined the official proration schedules and are unable to find any figures even close to the 356.03 referred to in their telegram. Would you please state once more for the record what the status as you have computed it, was for the Ohio 600-acre unit, as of June 30, 1957?

A Gettingback, since you read that telegram, the figure he quotes, 356, that is our Exhibit Number 1 of the production for the year 1956, and would be the status of the wells as of December 31, 1956. We show on Exhibit Number 1 there a three and three-quarter unit produced a billion 356 million, or average of 356 million 525 thousand per unit at the end of the period, December 31, 1956. Their three and three-quarter unit was actually over-produced 743,024,000. It would sound like it would have been better to let it alone the way he had it the first time.

MR. COOLEY: That's all.

MR. PORTER: The witness is excused.

MR. CAMPBELL: Mr. Keller.

MR. HINKLE: Clarence Hinkle, Hervey, Dow & Hinkle, Roswell, New Mexico, representing Humble Oil and Refining Company. We would

like to ask Mr. Keller some questions, particularly with reference to Exhibit Number 7.

MR. PORTER: Before we begin with the Cross-Examination of Mr. Keller, the proration schedule as requested by Mr. Couch, will be incorporated in this record.

MR. CAMPBELL: You mean the entire schedule?

MR. PORTER: No, just the one.

MR. COOLEY: The one showing the status of the Ohio 600-acre unit, for the period in question.

MR. CAMPBELL: Will that be just one month's of all the gas pools?

MR. COOLEY: No, just the Jalmat.

MR. PORTER: Just the Jalmat.

MR. COOLEY: Just incorporated by reference, not as a part of the record.

MR. CAMPBELL: All right.

MR. PORTER: Any question of Mr. Keller?

MR. HINKLE: Clarence Hinkle, Humble Oil and Refining Company.

W. O. KELLER

recalled as a witness, having been previously duly sworn, testified as follows:

CROSS-EXAMINATION

BY MR. HINKLE:

Q Mr. Keller, on your direct testimony last month, I believe you testified in effect that any proration formula which might be adopted, should have a direct relationship to gas reserves?

A No, sir, I don't believe I did, Mr. Hinkle. I said that it should bear a reasonable relationship to reserves, not necessarily a direct relationship.

Q I believe that you also pointed out that in your opinion, 100% acreage formula does not protect correlative rights in that it does not give each well an opportunity to produce in relation to it's reserve?

A That is correct.

Q I believe that you also stated in effect, that any deliverability formula should reflect correlative rights between tracts to some degree?

A Yes, sir, that there is a general relationship between reserves and deliverability, that is correct.

Q Then it is your opinion that any deliverability formula adopted by this Commission should take into consideration at least to some degree, the relationship to reserves?

A Well, it's my opinion that in the Jalmat Field, a deliverability factor in the formula will have a relationship to reserve,

or will result with allocation in a relationship to reserve.

Q Mr. Keller, I would like for you to refer to your Exhibit Number 7, which is on the back board, which is "Gas Reserves". I understand that the left hand column shows the factors which enter into the recoverable gas in place, is that right?

A Yes.

Q The right hand column shows the factors which make up deliverability?

A That enter into the determination of deliverability, yes, sir.

Q Now, I believe that the substance of your testimony with respect to Exhibit 7 was to show that 100% acreage allocation does not take into consideration all of these factors which have a direct bearing on the reserves in place except acreage?

A Yes, that's true, Mr. Hinkle, except I don't believe I testified that they all have a direct bearing.

Q Well, they have some --

A They have some relationship.

Q They have some relationship to reserve?

A Yes.

Q Now, I believe that you also pointed out that in the deliverability equation, that appears at the bottom of the right hand column of Exhibit 7, that most of the reserve factors are taken

into consideration?

A Well, I think I pointed out that the factors of net pay thickness, and pressure, which enter into the N value, or the determination of deliverability also enter into determination of the recoverable gas in place.

Q Well, in your equation, you do take into consideration most of the factors which you have listed in the left hand column under "Recoverable Gas in Place" like net pay thickness, pressure, and the quality of pay, efficiency of completion --

A I believe --

Q -- also permeability?

A That's right. Net pay thickness, pressure, and permeability enter into both the determination of deliverability and recoverable gas in place, I believe was my testimony.

Q Now, I would like to ask you, Mr. Keller, a few questions in regard to the equation which you have with respect to deliverability, which appears at the bottom of the right hand column on Exhibit 7. Now, "T", I understand, was used in the equation to represent the net pay thickness which is one of the factors you have listed on the left hand column under "Recoverable Gas in Place" --

A That is right.

Q Now, does this necessarily mean the thickness of the pro-

ductive pay, or zone?

A Well, I intended it to represent the net pay thickness of the gas production zone, yes, sir.

Q Insofar as it is a part of the deliverability test and formula, is it not more a function of the thickness of the pay exposed to the well bore than the entire pay available to the drainage by a well?

A Well, that is certainly true in respect to the deliverability. I perhaps should have pointed that out. I'm assuming that the whole pay section is open to production. Of course, if it is partially behind the pipe, then it will not enter into completely the determination of the deliverability.

Q That may not always be the case; that is, the whole pay section be open, is that right?

A That's right. That was part of the reason that I had this fifth factor listed, this efficiency of completion also bears on the deliverability, and if I failed to point that out as part of the efficiency of completion, then I should have done so. I intended to.

Q Now, let's take an example. Let's assume that we have a well which has a hundred feet of net pay thickness, and that only the lower 50 feet is open to the well bore through perforations. Would this well necessarily have the same deliverability as if it

had the entire 100 feet open to the well bore?

A No, sir.

Q Now, in this example which I have cited, would there be any difference in the gas reserves in place?

A You mean the only thing being different, the only factor that is varying, is that part of the pay --

Q That's right, is not open in the well bore.

A Normally, I wouldn't think that would affect the recoverable gas in place.

Q Well, it doesn't reflect though, the reserves in place necessarily?

A That is correct. Now, if the productivity of the well could be low enough to where it might affect the abandonment pressure, and in that manner have an effect on the recoverable gas in place, but the manner in which it would affect the recoverable gas in place would be different than the manner in which it would affect the deliverability.

Q Now, if the capability of the well declines, is it always possible to expose more section, and to attempt to increase the productivity by such workovers, or stimulations?

A I don't know whether it is always possible, but it often is.

Q Wouldn't it be possible in the case which I have given you,

where you had 100 feet of the section, and only 50 feet open, to go back and perforate it and get a larger deliverability?

A That seems reasonable, yes, sir.

Q Would it not be possible to acidize or frack, or by other workover methods, increase the deliverability?

A That is always possible, yes, sir.

Q Now, in the example which I have just given, the fact that only 50 feet of the 100 feet is exposed to the well bore, or that more section is exposed by later workover, or the well is stimulated have no effect on gas in place, is not true of deliverability?

A I'm not sure I understood that question, Mr. Minkle.

Q I'll repeat it. In the example which I have just given, the fact that only 50 feet of the 100 feet is exposed to the well bore, or that more section is exposed by later workover, or the well is stimulated, have no effect on gas in place, is not true of deliverability?

A I believe that is correct. The gas in place would not change, although the factors that you have mentioned would affect the value of the deliverability, that is certainly true.

Q Now, the amount of zone open, when it is open, and how it is stimulated, do influence and change the deliverability?

A Yes, sir.

Q Now, let's assume a practical case wherein we have string-

ers separated by shale, or dense rock, would a well with it's 100 feet initially exposed be expected to produce essentially the same ultimate volume of gas as the well with 50 feet initially exposed, and the remaining 50 feet exposed by subsequent workovers, all other factors being constant?

A I'm not sure that I followed that question.

Q Assume the case where you have the zone separated by shale or dense rocks, you have separate reservoir within the pay section you might say, in that case, with it's 100 foot initially exposed could a well be expected to produce essentially the same ultimate volume of gas, as the well with 50 feet initially exposed, and the remaining 50 feet exposed by subsequent workovers, all other factors being constant?

A I'm not sure that I can answer that question, Mr. Hinkle, under the assumptions.

Q What I'm getting at, you are exposing two sections at different times by workovers, and would you be expected to receive, or recover the same amount of gas, ultimately?

A Well, of course the amount that each well would recover would depend primarily on how much they were permitted to produce, but if they were permitted to produce at the same rates for the same length of time, I would say they would get the same recovery.

Q Now, let's take the case of an operator who perforates his

casing with two shots per foot, and another operator who perforates with six shots per foot. Let's further assume the practical situation wherein there is no communication vertically, but there are variations in rate and no vertical communication, would the deliverability of these two cases necessarily be the same?

A Oh, they could be the same, yes, sir, or they could be different. If the small perforations served as a choke to a greater extent than the well with more perforations, well they might be different, but normally, the perforations don't offer much restriction, that doesn't seem to be the main bottleneck.

Q Let's assume with the same difference, would this necessarily reflect on the reserves in place?

A No, it wouldn't necessarily. There certainly can be things done to a well which will change the deliverability, such as treating or manner of perforating, or where they are perforated, which will change the deliverability of that well, but will not necessarily change the recoverable gas in place. That's certainly true, Mr. Hinkle.

Q That's what I want. Now, then to establish a maximum deliverability for allocation purposes, it behooves an operator to complete his well with the air of maintaining the best deliverability test, does it not?

A Well, certainly, if there is a deliverability factor in

the formula, it behooves an operator to complete as high a deliverability well as is practical, and certainly to my mind, it behooves any prudent operator to complete his well as efficiently as possible.

Q And if that is the fact, wouldn't it at least to some degree dictate the completion practices to be followed by operators, whether or not there might be completion practices which a prudent operator would follow?

A The deliverability factor in an allocation formula certainly might influence the manner of completion, that's certainly true. However, it's been my observation that in a field like Jalmat, most operators try to complete their wells to get as good a well, or as high a productive well as possible, regardless of what the allocation formula is.

Q Now, it would be more economical, would it not, for example, to shoot two or three shots per foot instead of six per foot, and a top allowable well is not precluded just automatically, just because of shot density?

A Well, to my way of thinking, it is not very practical to consider the economics of shooting two shots, or six shots a foot. I think the economical thing to do is to perforate as effectively as you can.

Q What I'm getting at, because the deliverability might

dictate unprudent completion practices, wouldn't it also cause the expenditure of unnecessary funds, and economic waste, and those funds could be used for other development, rather than for work-overs on these wells to get up deliverability?

A Well, Mr. Hinkle, I don't agree with your premise that the deliverability formula would cause imprudent completions. Therefore, I don't agree with your conclusion that you might waste some money by completing inefficiently.

Q Now, Mr. Keller, the next factor which you have in your equation appearing at the bottom of the right hand column of Exhibit 7, you have P. S., which is a shut-in pressure squared minus the working pressure squared, to the "n" power.

A Yes, sir.

Q Now, I believe that you have testified that pressure factors have a direct effect on deliverability, and some relationship to reserves?

A No, sir, I don't believe I testified that the pressure has a direct relationship --

Q I said some relationship?

A Excuse me, I thought you said "direct relationship on the deliverability". They have approximately direct, the pressure has an approximately direct relationship to the gas in place; the manner in which it enters into the determination of deliverability

is as shown by the equation on the lower right hand side of Exhibit Number 7; that is, the deliverability will vary with the difference in the squares of the pressures, all other factors being equal.

Q Now, the pressure term in the deliverability equation which I have referred to, is the quantity shut-in pressures squared, less working pressures squared raised to N-power, is that right?

A Yes, sir.

Q You have recommended that the deliverability pressure be 80% of the shut-in pressure, have you not?

A Yes, sir.

Q You have also recommended that an average value of N be used, and I believe you suggested about .8?

A Yes, sir.

Q Now, what is the relationship to gas in place of a well with 1,000 pounds per square inch shut-in pressure, as against a well with 500 pounds per square inch shut-in pressure, all other factors being equal?

A Well, as I stated before, it's a direct relationship of 2 to 1; that is, all other factors being equal, the tract with the higher pressure, twice the pressure, would have twice the gas in place.

Q Now, let's take these same two shut-in pressures, 1,000 pounds and 500 pounds, and say that they applied to two different

wells; also take deliverability tests of these two wells, according to your formula, and assume that the working pressure in each case is 80% of shut-in pressure. This would be 80% times 1,000 which would be, that would be 80% times 1,000, which would equal 100, would it not, and it would also be 80% times 500, which would equal 400 in these two instances, and also assuming that "N" is .8 in each case. Now, 1,000 times 1,000, minus, using your equation, minus 800 times 800 to the .8 power, is equal to 27,860, is that not right?

A That's approximately right, yes, sir.

Q 27,860. Now, let's take the case where we have the 500 pound shut-in pressure, applying again your equation, 500 times 500 minus 400 times 400, to the .8 power, would equal the way we figure it, 9,192. See if you won't accept that.

A How much did you get?

Q 9,192.

A That would be 25,000, minus 16,000, which would be 9,000 to the 8/10ths power, which would be something less than 9,000.

Q Well, you agree that it is approximately 9,000?

A It is something slightly less than 9,000, yes, sir.

Q What I am getting at, if it is 9,000, and you used a thousand in the other case there would be a ratio there of approximately 3 to 1, would there not?

A Oh, yes, sir, the ratio of the deliverability, as a function of pressure is entirely different than the ratio of the reserves as a function of pressure; yes, sir, that is true.

Q Where you had the well with the 1,000 pound shut-in pressure, it would be -- you would have twice as much gas supposedly in reserve, as the one with the 500 pound pressure?

A Yes, sir.

Q Yet, at this moment, under this deliverability equation shown, you would be permitting that well to produce three times as much gas, would you not?

A No, sir.

Q Why wouldn't you?

A Because, the allocation formula that I recommended was 75% acreage times deliverability, plus 25% acreage.

Q Now, as to the use in the reserve formula, this pressure difference indicates a 2 to 1 difference?

A All other factors being equal.

Q As to deliverability, it indicates a 3 to 1 difference?

A Approximately 3 to 1.

Q So, there is a 50% variation from reserves in this example?

A Well, that is correct in that example; the deliverability under those conditions fails to be directly proportional, fails to bear the same proportionality to pressure. Let me start all

over on that.

In that example, the ratio of deliverability to gas in place fails to follow the same proportion to pressures by about 50%, that is correct. Of course, Mr. Winkle, I might point out too, that if they had the same acreage, there would be a greater, a greater disparity; on that basis, they got the same allowable per acre, yet there would be twice as much gas in one place under the one example, as the other.

Q Now, on examples which I have cited, would you say they are realistic as far as the Jalmat area is concerned? Would you have that much pressure differential?

A Yes, I think the thousand and five hundred pound assumptions are within the range of what you will find in Jalmat, yes, sir.

Q In the n that you have used in the equation, is it realistic as far as Jalmat is concerned, the .8?

A Yes, sir, that was what my average of the data that I had showed, about five; actually, I think the number was .818 out of about 300 tests that were available to me.

Q Let's take another example, using our well with 1,000 pound shut-in pressure. In the reserve formula,this pressure expressed as the absolute pressure enters directly and exerts an influence of about 1,000 to 1, does it not?

A I didn't understand that.

Q In the reserve formula, this pressure expressed as the absolute pressure enters directly, and exerts an influence of about 1,000 to 1?

A I'm not sure what pressure you are talking about, or what influence, or what you are talking about, Mr. Hinkle.

Q That is 1,000 pounds shut-in pressure?

A Yes, sir.

Q In the reserve formula?

A I don't understand.

Q I said in the reserve formula, this pressure expressed as the absolute pressure enters directly and exerts an influence of about 1,000 to 1?

A No, sir. It exerts a relative influence --

Q That is in the recoverable gas formula?

A Sir?

Q That is in the recoverable gas formula?

A Yes, sir, my answer is no, it doesn't exert an influence on the reserve of a thousand to one. I think a truer statement would be the one that I have previously made, is that the pressure enters into determination of gas in place in a direct fashion; that is, if you double the pressure, you double the gas in place, and not -- it would be a thousand to one, comparing a thousand pounds pressure in the reservoir with one pound pressure.

Q You are placing a value of 1,000 in that equation, are you not, when you use 1,000 shut-in pressure?

A Yes, sir.

Q Now, let's take the 1,000 pound well, give it a deliverability pressure of your 80%, or 800 pounds, and use your n of .8, and put these factors in your deliverability formula on the right hand column. That would be 1,000 times 1,000, minus 800 times 800, raised to the .8th power, which would again give you the 27,860. This in itself, is an influence is it not of about 28,000 to 1?

A Obviously it's not, Mr. Hinkle. We have already said before that it was in direct proportion, the same as 27,800 is to 9,000, so the influence is 3 to 1.

Q Well, but you have in that formula, under those findings, the sum, 28,000, do you not?

A Yes, sir. You have the sum, but that doesn't mean that that is the proportion with which the pressure influences the deliverability by any means.

MR. HINKLE: I believe that's all.

MR. PORTER: Mr. Webb.

MR. WEBB: Layton Webb with Sinclair.

BY MR. LAYTON WEBB:

Q Mr. Keller, in answer to Mr. Hinkle's question, where he said that the ratio of deliverability was approximately 3 to 1,

where it was under your deliverability factor, and only 2 to 1 under the recoverable gas in place factor, you answered with the statement that that would not be a direct ratio, because of the 25% acreage plus 75% of acreage, times deliverability. Can you tell me what part, what percentage deliverability plays in your formula?

A Well, yes, sir, I can.

Q All right, I would appreciate it if you would.

A The deliverability --

Q The percentage I'm talking about, how much is acreage, and how much is deliverability, percentage?

A Well, the deliverability is a factor which is used to modify acreage; that is, it is a quality factor from my viewpoint, and the weight given is not given directly to deliverability anywhere in the formula. It is given to deliverability times acreage, and it appears that is given, that is 75%.

Q Then you aren't intending to lead the Commission to believe that deliverability plays a 37½% percentage-wise part of this allocation formula that you are proposing, are you?

A No, sir, I don't believe that's true.

Q All right, I'll give you an example. We'll start with the most extreme 1 to 1 end. Let's suppose that every unit in the Jalmat Field was 160 acres. Now, what percentage would your de-

liverability play in the total allocation formula?

A Well, of course, what that is when you make the acreage per well the same, then you in effect cancel out so that the percentage times deliverability is 25%.

Q So, deliverability is 75% of your formula under that situation, is that correct?

A If you cancel out the acreage, yes, sir, that's got to follow.

Q Do you know how many 160 acre units there are in this field?

A Offhand, I don't.

Q Would it be the majority of the field on 160-acre units?

A Yes, sir, I think that is true.

Q I don't quote this as being actual, but let's say 75% are 160 acres; then your deliverability factor is still playing substantially 75% of your percentage in your allocation? It would be 75% of 75%, wouldn't it?

A Well, you can look at it that way; that is as to all the wells that have 160 acres.

Q That is what I'm talking about.

A That is true, but it is not true as to the rest of the wells that have a different amount of acreage assigned to them, where the equality of acreage doesn't cancel out the acreage factor.

Q But the more units that you have toward a majority of 160

acre units, would tend to cause your deliverability factor to play a greater part in more of the units in this field? In other words, it would be more than 37½% in the majority of the units in this field, wouldn't it? It probably would be more than 50% in the majority of the units in this field?

A By "it would be", I don't quite understand what you mean by that.

Q The percentage of your allocation formula, the deliverability which is based on deliverability, would be more than 50% after you actually computed it out, taking the nominations and the allowable, take your acreage out first, 25% acreage out first, and then allocated the rest as a result of acreage times deliverability in the majority of the units in this field, deliverability would account for more than 50% of your 75% acreage times deliverability?

A As to those particular wells, that is true. Of course, as I recall, there were 170 wells during 1956 that were on 100% deliverability, that is, they couldn't make the acreage allocation, so they produced at 100% deliverability, so if we want to look at it that way, you have already got more deliverability than my formula recommends, if you raise the field rate high enough.

Q Now, would the difference in the deliverability rate, which you are including in your 75% of acreage times deliverability, would the fact that that is a great deal greater than the figures

that you are using for acreage, which I assume you have used 1, 2, 3, and 4 being the unit figures, is that correct? Could that possibly make any difference in the part that deliverability plays in that 75% of acreage times deliverability?

A I'm not sure I understand your question, but it seems to me --

Q But I understand your formula, that is the whole thing?

A -- it seems to me rather obvious that when you have a factor of 75% of one factor, times another, that in this case you are qualifying the acreage assigned to the well, using deliverability as a quality factor. Of course, if all the wells were assigned an equal amount of acreage, then you would in effect have 75% of your allowable assigned on strictly a deliverability basis. Now, that is just like in oil allocation, if you have got all your wells drilled on 40-acres, even though your allocation is 100% acreage, you can still say it is 100% per well.

Q But what prompted this question --

A So, I don't see how you can determine how much weight you are giving to deliverability in the facts you are suggesting.

Q But what prompted this question was your answer to Mr. Hinkle, which indicated -- he said that pressure in the example in your deliverability example, would increase your allowable and the ratio of approximately 3 to 1, whereas it would increase your gas in place only 2 to 1. You said that that was not true, and I agree

with you that that is not exactly true, but what I'm trying to get is how much does it increase? The thing being, I have assumed first the most extreme situation where every unit in there is 160 acres; then it would increase it at least 75% of 3 to 1, wouldn't it?

A Under that --

Q Do I make myself clear?

A I think so. Yes, sir, I think what you said is essentially correct.

Q In other words, when Mr. Hinkle said we could take the example to a more absurd extreme. Let's suppose a thousand pounds and 200 pounds then your ratio is 5 to 1, leaving out your "N" power, your .8 there, assuming that the Nth power is 1, for easy computation, then it is 5 to 1, is that right? That is under your reserves in place, 5 times the reserves in place, under the thousand pounds pressure that there is under the 200 pounds pressure, all other things being equal?

A That's right.

Q Now, when you take your deliverability factor and you square that, you would have 4 to be subtracted from 100, wouldn't you? 2 from 2 is four, and -- now, what would your ratio then be?

A I believe you would subtract 40,000, wouldn't you?

Q Well, okay, 40,000 from 1,000,000.

A That's right.

Q Then what would your ratio be, as between wells, one having a pressure of 1,000 pounds, and the other having a pressure differential of 200 pounds in your deliverability factor?

A What is the working pressure of the well with the 200 pound pressure?

Q Well, 80%, we'll take your 80%.

A Just a moment, I will have to calculate that. I calculate, comparing one well with 1,000 pounds pressure, flowing against 80% of it's shut-in pressure, comparing a well with a 200 pound pressure flowing against 80% of it's shut-in pressure, assuming all other factors are equal, that the well with the thousand pound pressure would have about 67 times as much deliverability as the well with 200 pounds.

Q That is the point I wanted to make. Now, how much part, does that deliverability that you have calculated there, play in your allocation formula, 25% acreage times 75% acreage times deliverability? What percentage does that range? Can you give me a range of percentage? We have already established it can go up to 75%, where all the units are equal.

A Well --

Q I don't know, now, I'm honest, I haven't computed it.

A If you use the 75, 25 formula that I have recommended, the

deliverability is multiplier of acreage, it modifies acreage and in this particular instance, as to 75% of the allowable, it seems to me that the higher pressure well is 67 times better per acre than the lower pressure well on a deliverability basis, that is, as to 3/4ths of the allowable.

Q That would be a direct effect on your allocation formula. I think we can say it would be 67 times greater, of the 75% you are going to leave the 25% static?

A If you make the acreage equal between wells, under the hypothesis that we have made here, that is correct.

Q That was the point I was trying to make, and didn't know how to make it. I have one further question, if I may. Let's assume 320 acre tract, or lease, and this tract or lease has located on it two producing wells. I don't understand your formula well enough still to use figures, but let's assume that the north well and the south well, let's call them wells "A" and "B", north and south, have the same reservoir characteristics, except pressure, that is the term you used. The north well "A" has twice the pressure of the south well "B", all other factors being equal. Now, under the present allocation formula, each of those wells would get the same allowable, assuming their ability to produce, is that correct?

A Yes, sir.

Q Now, under the present allocation formula, if the operator who owns both of these wells decided to shut in the south well, which was a weaker well, and assign his acreage there to the north well which is the stronger well, then the lease allowable would remain the same, it would just be that the north well, or the stronger well, would have the full allowable for the 320 acres, is that correct? That is, on the present field.

A Well, if you assign 320 acres to a well instead of 160, you will have twice as much allowable, yes.

Q Under your allocation formula, and I hate to repeat Mr. Hinkle's remark as to your statement, but you said that any allocation formula should bear some approximate relationship to reserves. I suppose you meant recoverable reserves in place, is that correct?

A I believe I said reserves.

Q All right. What did you mean by "reserves"?

A I meant reserves.

Q All right, reserves. Again, this same operator desires to shut down this south well, or this well which has the deliverability half of what the north well has, he does this because we have adopted your allocation formula, and as I understand the field rules which you propose, this would be possible.

Now, he shuts in this south well, and assigns this 160 acres to his north well, or his good well, what would be the result of

his new allocation for that 320 acre tract?

A I say the hypothesis is that the north well has twice the pressure, or twice the deliverability.

Q Twice the pressure?

A Twice the pressure, or twice the deliverability.

Q Twice the pressure, I believe that is what we started out with. Yes, twice the pressure.

A I'll have to figure that.

Q Well, can you give me the answer on deliverability?

A Well, if we may go back to the example that Mr. Hinkle used, under those circumstances about the deliverability, it would be increased about 3 to 1.

Q About 3 to 1; and therefore, you would be, if I calculate correctly, you would be increasing your allowable on this 320 acre tract by shutting in one well, by approximately 33 and 1/3 percent plus or minus a few percent, to correct for your N power.

A You would be as to half of the acreage, giving it three times the acreage times deliverability factor, which is 3/4ths, so I believe it would be figured out more than that.

Q I am satisfied with 33 and 1/3 percent.

A I'll accept your 33.

Q All right. Have you increased the reserves any under that tract by shutting in the well on the south part of the 320?

A If you have increased it's allowable, you probably have.

Q I beg your pardon, I didn't understand that.

A If you increased your allowables, I think you have.

Q Increased your recoverable reserves in place under that tract by shutting in that well in the south end of the tract?

A Not necessarily the recoverable gas in place.

Q Well, any kind of reserves in place?

A The reserves that are producible from that tract may be produced, increased, as a result of that.

Q By your ability to produce your neighbors' reserves, is that what you are saying?

A Or prevent him from capturing your reserves --

Q No, we had these two wells --

A -- as a result of migration anyway.

Q We had the two wells, we shut one of them in, do you increase your reserves by shutting that well in?

A If you increase the allowable of the tract, you may increase the reserves, it's quite possible, yes, sir.

Q Then it is your testimony, I understand, that the allowable on the tract of land bears a direct relationship to the recoverable reserves in place, is that your testimony?

A No, sir, I did not say that. I said that the allowable may affect the reserves of a well.

Q By that you mean what can be pulled out through the well bore?

A I mean by that --

Q You are not talking about reserves in place at any given time on this tract, are you?

A I'm talking about the reserves recoverable from that well.

Q But not from the tract? You are not limiting it to that tract?

A Well, I'm not specifying where the reserves come from, because I don't know under your hypothesis where they come from.

MR. LAYTON WEBB: No further questions.

MR. PORTER: Mr. Dipple.

MR. DIPPLE: Harry Dipple for Continental Oil Company.

BY MR. DIPPLE:

Q Mr. Keller, I'm going to have to perhaps review a little bit with you, some of the things that you have already been asked about, because frankly I don't understand it. But, first, right at this point, I would like to ask you as a followup to what Mr. Webb has just asked you, are you proposing that gas prorationing in the Jalmat Pool be based on the law of capture?

A Mr. Dipple, I am proposing that it be based on an allocation formula, based on 75% to acreage times deliverability plus 25% to acreage.

Q Well, I believe I understood you --

A I'm not sure if that is the law of capture; I may be proposing that, but that is what I propose.

Q Didn't I understand your answer correctly to in effect say that that well that he was asking you about, would perhaps produce gas that came from some other source besides the acreage on which this well unit was situated, and that it might be somebody else's gas?

A No, sir, I did not intend to imply that.

Q Will you explain to me then how deliverability is going to increase recoverable gas in place. Let's don't forget the "in place".

A I've already explained, Mr. Dipple, that it is not my testimony that the deliverability of a well determines the recoverable gas in place. It has been my testimony that some of the same factors, such as pressure, pay thickness, and other factors, enter into both of those things, but it does not follow that the deliverability determines the recoverable gas in place.

Q Let me refer you to your testimony on page 60 of the transcript of last month's hearing. You were answering a question there, the question by your counsel at the bottom of page 59 is, Question: "What do you recommend as a better formula for the allocation of gas in the Jalmat Gas Pool?" Your answer was, "I would recommend

as an improvement in the present formula, a formula whereby 25% of the total allowable of the field is allocated on an acreage basis in a manner similar to what is now being done on a 100% basis. The remaining 75% of the total field allowable I would allocate to the various wells on the basis of acreage times deliverability factor, where the deliverability of each well is defined as that amount of gas produced per day by the well, against 80% of the shut-in pressure of each well"...

Now, I would like to ask you, is that your definition of deliverability for the Jalmat Pool, or is that your definition of deliverability in whatever pool?

A That is my recommendation as to the method of determining the deliverability in the Jalmat Pool for use in the allocation formula that I have recommended for that pool.

Q Well, can you give us a definition of deliverability?

A Yes, sir, deliverability is a measurement of a well's ability to produce, under a given set of pressure circumstances.

Q Well, maybe you answered me, but I didn't understand it. Is this definition that I have read to you from this transcript, your definition of deliverability for the Jalmat Pool?

A It is the one that I have defined for the Jalmat Pool for use in this formula, Mr. Dipple. In order to define deliverability, you must define other conditions such as the back pressure you are

against at which the well will be produced. In that manner, it's possible to make the deliverability results as between wells on a comparative basis. It's a matter of setting a standard of measurement of determining a well's capacity to produce, which is equally applied to all the wells.

Q Well, why did you choose 80% in this definition?

A Primarily because that is a customary way to define deliverability --

Q 80% --

A -- against 80% of the shut-in pressure, yes, sir.

Q Do you know about any other percentages that have been used?

A Offhand, I don't. That's the one I am familiar with.

Q Sir?

A Offhand, I don't. That is the one I am familiar with.

Q Would you say that 70% would be incorrect?

A No, sir, I would not; you could measure deliverability against 70% and still have a pretty good relative measure between wells of ability to produce.

Q Could we say 60%?

A Yes, sir.

Q How about 50?

A Yes, sir.

Q Well, would you propose 50% for the Jalmat formula?

A No, sir, I have proposed 80%, because that particular percentage to my opinion, fits more nearly the line and shut-in pressures of most of the wells in the field. It's a matter of convenience. In some fields they use open flow capacity, which is a deliverability of a well against atmospheric pressure.

Q Now, Mr. Keller, is there any substantial difference between deliverability as a factor in an allocation formula in gas prorationing, and potential as a factor in oil prorationing?

A Yes, sir, I think there is a substantial difference.

Q Can you tell us what that is? What that difference is?

A Well, I think deliverability, where you set up the conditions of flow, one well to another, on the basis of it's shut-in pressure, gives a better relative measurement of ability to produce than a potential test on an oil well, because there's no standard of comparison in my opinion, the same standard is not applied to each well.

Q Well, there is some standard applied isn't there in measuring the potential of an oil well?

A Yes, sir, that's it's maximum capacity to produce.

Q That's it's what?

A It's maximum capacity to produce under whatever conditions exist as to that well.

Q Would you advocate and recommend using potential as a

factor in prorating oil wells?

A Oh, I don't know whether I would or not, Mr. Dipple. I have never had occasion to. It would depend, if that factor, in my opinion, resulted in allocation of allowable in a reasonable approximate relationship to reserve, it is entirely possible that I might. My criteria is simply that, that the allocation formula must, in my opinion, allocate allowables in some reasonable relationship to the reserves.

Q Well, do you know of any oil fields in New Mexico that have potentials as a factor in prorationing?

A No, sir, I know there are gas fields with deliverability, though.

Q Do you know of some gas fields where the deliverability is not a factor, in New Mexico?

A Yes, sir.

Q The Jalmat is one, isn't it?

A Yes, sir.

Q I would like to refer you to page 60 of the transcript. Your last answer on that page. I frankly don't understand it. The question was, "Do you consider that the testing procedures in that directive are adequate to properly operate the formula which you have suggested here?" Will you look at that answer and see if that is your correct answer?

A Mr. Dipple, I noticed that in reading that answer, and I believe it should read, "Deliverability against 80% of the shut-in pressure on the basis of the average", then letter "N" instead of "in volume", N-value for the field.

Q Letter "N" instead of the word "in", "N" in front of volume?

A Yes, instead of "in volume", I believe that should be "N-value". I wasn't speaking clearly.

Q Now, Mr. Keller, I would like to refer you to page 62 of the transcript. In your answer on that page, what do you mean by "relative gas reserves of the various wells"...and so forth?

A Whereabouts on that page are you referring to, Mr. Dipple? I haven't found it.

Q Page 62 --

A By "relative gas reserves" on page 62, I meant the gas reserves of one well relative to another.

Q You are not talking about recoverable gas in place?

A No, sir, I'm talking about the reserves to be recovered from those wells.

Q Now, I would like to refer you to Page 63 of the transcript. Near the center of the page, Mr. Campbell asked you this question: "Now, Mr. Keller, I have noted that on that Exhibit" -- we are talking about Exhibit Number 7 -- "you have stated, as I understand you, that the gas reserves are determined by a relationship between

recoverable gas in place and the deliverability, and that acreage appears only as one of five factors in the determination of recoverable gas in place. Does acreage appear any place else as a factor in determination of gas reserves?"

Your answer is, "No, sir." Do you agree with the statements made in that question by your counsel?

A Well, I certainly agree that acreage is only one of about five or more factors that enter into the determination of recoverable gas in place, and that I certainly -- it's been my experience that the gas reserves of a well are determined usually by the amount of gas in place in the area, and it's ability to produce.

Q You will notice this question says that there are five basic factors that enter into the determination of recoverable gas in place, and deliverability, is that right?

MR. CAMPBELL: Five each.

A No, the way I read that, he says that the gas reserves are determined by a relationship between recoverable gas in place, and the deliverability, and that acreage is only one of five factors in the determination of recoverable gas in place.

Q All right. How many factors are there in the determination of deliverability?

A Well, I have reduced those to four basic factors on Exhibit Number 7, Mr. Dipple.

Q Well, there are four under deliverability, and five under recoverable gas in place on your Exhibit Number 7, is that right?

A Five main ones, yes, sir.

Q Now, over on the left hand side, under "Recoverable Gas in Place", under quality of pay, you list porosity as a secondary factor, I take it, the way you have it set up there?

A Well, the way I intend that is that is one of the measurements of the quality of pay, is the porosity.

Q Well, porosity is a primary factor though, is it not?

A Well, I have included it as one of the ways of measuring the quality of the pay. It's a primary factor in that your recoverable gas in place is directly proportioned to the porosity, all other factors being equal.

Q Yes, sir. You also have shown under "Quality of Pay", under "Recoverable Gas in Place", permeability as a factor.

A Yes, sir.

Q Now, the effect of permeability in determining recoverable gas reserves goes only to the recovery factor, and not to the actual gas in place, doesn't it?

A That is true, yes, sir, directly.

Q The recovery factor depends on the lowest pressure at which the well can be economically operated, all other things being equal, is that correct?

A Yes, sir, economic abandonment of pressure.

Q Now, in your opinion, what effect would the variation, of the range in permeability in Jalmat, have on the range of abandonment pressures?

A It would be very small, I would say.

Q Would be very small?

A Yes, sir.

Q Then, as a factor, under "Recoverable Gas in Place", permeability is not in the same range of importance, let us say, as porosity, for instance, is it?

A No, sir.

Q It is only a minor factor in recoverable gas in place, isn't it?

A Normally, that is correct, Mr. Dipple. It might for extremely tight wells, it might be appreciable, but normally in Jalmat I would say, it would be a fairly minor factor.

Q But as a factor in deliverability, it's quite important, is it not?

A It's in direct proportional relationship, yes, sir.

Q Now, on your Exhibit 7, you have listed apparently as a major factor, under both "Recoverable Gas in Place", and under "Deliverability" as number 5, "efficiency of completion". In your opinion, does "efficiency of completion" have any effect on recover-

able gas in place?

A Yes, sir.

Q It does. Let us assume a situation where you and I are adjoining operators on adjoining leases, and we have all factors equal except that my being a poor operator I haven't completed my well as efficiently as you have yours. Is that going to put gas in place under your lease, and if it is, tell me how?

A No, sir, it's just going to determine the ability of each of the wells to recover the gas in place. It won't change the gas in place.

Q Sir?

A The gas in place is there before the well is ever drilled, and anything about the drilling of the well, of course, doesn't change the gas in place.

Q So, efficiency of completion has nothing to do with recoverable gas in place?

A Oh, yes, it does.

Q I thought you just said it didn't have?

A I said it didn't have anything to do with the Gas in Place, but it does have a bearing on how much of that In Place Gas will be recovered.

Q But that is something different. I'm talking about recoverable gas in place, not recoverable gas in place that is going to

be recovered. You mean to say that in any given pool, that all the Gas in Place is always going to be recovered, is it?

A Yes, sir, that is my definition of Gas in Place, is that amount of In Place Gas that will be recoverable, that will be recovered, that is the way I use the term, Mr. Dipple.

Q In the illustration I cited where you are the efficient operator, and I am not, you will actually be recovering some of my gas?

A It is possible, but it does not necessarily follow that I will.

Q Where will you get the additional gas that you are going to produce that isn't in place under your tract?

A If we assume that I'm going to recover more gas than the Recoverable Gas in Place underneath my tract originally then, of course, it necessarily must follow that it must come off of surrounding tracts, maybe not yours, but maybe my south neighbor. Migration is a factor in any field, and it's something that I didn't create or anybody else, but it's something that is there, and I, as an engineer, recognize that it is there.

Q Isn't that one of the big reasons that we have prorationing of both oil and gas, because of migration, and because of the abuses that grew up under the old law of capture, isn't that right?

A As a matter of engineering, I don't know whether that is

right or not.

Q Well, let me ask you, doesn't efficiency of completion have more to do with the rate of recovery than ultimate recovery of Gas in Place under a given tract?

A It can operate both ways. It can be more important as to recovery, or more important as to deliverability, it all depends on the circumstances.

Q Now, referring again to your Exhibit Number 7, and the reason I'm apparently jumping around like this is, I'm trying to follow your testimony in the transcript. I'm not implying that you jumped around.

I believe that Net Pay Thickness is the only factor which you have shown under both Recoverable Gas In Place, and Deliverability, to which you have given the same value under both of them, is that right?

A Well, if you mean it's the only factor that I have tested that enters into the determination of both Recoverable Gas In Place and Deliverability in the same fashion, that is a direct proportion, I believe that's correct.

Q Maybe I should have stated it this way, referring to your equation under each one of those, I believe that Net Pay Thickness is the only factor which you have given the same value to in that equation --

A Well, I have actually --

Q -- or the same weight, I should say?

A I don't believe that is correct, exactly, Mr. Dipple. I would say it was the only one that operates in the two equations in the same manner. That is, it's the only one that influences deliverability in a direct proportion, and also Gas In Place in a direct proportion.

Q Well, now, you haven't weighed pressure the same under both?

A No, sir, I haven't weighed them under either one of them; they don't appear in the two equations in the same manner. They don't operate in the same manner. That is, pressure doesn't operate in the same manner in the determination of deliverability as it does in the deliverability of reserves. I think I pointed that out in my direct testimony.

Q Now, Mr. Keller, on page 70 of the transcript, at the bottom of the page, you started an answer in which you said that: "My experience has been that there are quite a few fairly large fields that employ deliverability in one fashion or another in the allocation of allowables to the various wells." Hugoton, I suppose, is one of the prime examples. Then it was brought out that that field extends into more than one State. It extends into Texas, doesn't it?

A Yes, sir.

Q Are you familiar with gas field rules in Texas in a general sort of a way?

A In a very general sort of a way, yes, sir.

Q Do you know of any recent field rules adopted in Texas for gas fields that include deliverability as a factor in the allocation formula?

A Well, I'm just not familiar with any recent field rules that have been adopted for gas fields in Texas, Mr. Dipple.

Q Now, Mr. Keller, I believe at some point in the testimony last month perhaps, I think in the testimony of Mr. Martin last month, it was brought out that there are some 367 units in the Jalmat Pool.

Now, bear in mind there are 367 units, and they are connected to seven different purchasers. I'm using the word "purchasers" here pursuant to it's definition in order 520. There are 367 units connected to seven different purchasers in the Jalmat Pool, and these purchasers have different requirements. Is it your opinion that the correlative rights value of these 367 units would be protected without gas prorationing in the Jalmat Pool?

A Well, as a matter of engineering, Mr. Dipple, I certainly couldn't tell this Commission that without gas proration, the take from the various wells would be reasonable in relation to reserves. Now, as a matter of law, whether or not the lack of proration would

protect correlative rights, I just don't know.

Q Well, let's assume there are two offsetting wells on different leases, and both of these wells are connected to the same pipeline, one of the wells is also furnishing gas for gas lift; would the correlative rights be fully protected if you didn't have gas proration?

A They would be if the takes -- in my opinion, they would be if the gas between the two wells bore some reasonable relationship to the reserves of the two wells.

Q Your answer is that in the case cited, that correlative rights would be protected?

A No, sir, that wasn't my answer, I don't believe. My answer was that the correlative rights would be protected, in my opinion, if the rates of takes between the two wells were in some reasonable proportion to the reserves of the two wells.

Whether or not that, to my mind, is the standard of protection of correlative rights, as I understand it, as set up by the Statutes now, I may be in error about my interpretation of what correlative rights are under the law, but that is my understanding.

Q I don't believe you have answered my question, but you have assumed something that I didn't assume in my question. Let me repeat my question.

We have two offsetting wells on different leases, and both of

the wells are connected to the same pipeline, the same transmission company; one of the wells is also furnishing gas for gas lift, that is, another purchaser taking the gas lift gas. One purchaser is taking gas from both wells into a transmission line, and one of the wells is also selling the gas to another purchaser for a gas lift. In your opinion without gas prorationing, would correlative rights be fully protected in that situation?

A I can't answer that question without additional information, because you haven't told me what the relative rights of the two wells are. The protection of correlative rights to my mind can only be answered if I know what those rates are, and whether or not they are related in a reasonable fashion to the reserves. If they are not, if your question assumes that the rates are not in reasonable relationship to the reserves of the two wells, then my answer is that the correlative rights are being violated under those circumstances. If you assume that the rates are in reasonable proportion to the reserves, then the correlative rights in my opinion would not be violated.

Q Let's assume that the Reserves In Place under each of the two leases are the same. Bear in mind, now, that the same pipeline company is hooked up to both wells, and I think we would almost have to assume this, you are going to take the same quantity of gas into the pipeline from each of these two wells, so let's make

that assumption, and then the other well sells to somebody for gas lift. Are you going to have a violation of correlative rights there?

A Well, it all depends on how much gas lift gas is used.

Q Well, to whatever extent it is being used, to that extent, correlative rights are going to be violated, aren't they?

A Mr. Dipple, not necessarily, in my opinion, because I have to recognize that the protection of correlative rights in proportion to reserves, is just an impossibility to attain as a practical matter, so I think that it would be reasonable for two wells to have different producing rates, or somewhat differently, with the same reserves, and still not have any violation of correlative rights, so long as those rates were somewhat close to their relative reserves, because we just can't allocate perfectly, it is just not possible.

Q I would like to refer you to Page 71 of the transcript, the second question. The question was: "Mr. Keller, you have heard the testimony of Mr. Martin and seen the exhibits that he presented with regard to the actual operation of gas prorationing in the Jalmat Gas Pool and as between individual units in the Pool. Do you believe that this situation might have been alleviated to some extent had there been some deliverability factor present in the gas allocation formula in the Jalmat Gas Pool?"

The answer was: "Yes, sir, I believe that the situation would have been alleviated, would have been less severe, since the take practices, I believe, during peak periods are always more nearly in proportion to deliverability than they are in proportion to acreage."

Now, I would like to ask you, are you recommending a formula here that will protect correlative rights, or one that will agree with the method used by the pipelines in producing the wells?

A Mr. Dipple, when I considered this problem, that is of recommending an allocation formula, my sole and primary consideration was the correlative rights problem. To my mind, that is the basic need and requirement of an allocation formula, that it does protect correlative rights and, of course, prevent waste, but the fact that the formula also corresponds to the take practices is coincidental and not planned. I recommend it as a means of protecting correlative rights, not as a means of helping the operating practices of the gas purchaser.

Q Don't you believe that it will have the other result more nearly than the protection of correlative rights, after what you testified to?

A I believe that it will more nearly protect correlative rights than the present allocation formula does.

Q Would you say that the test that has been thus far offered

in support of this application to the effect that deliverability should be a factor in the proration formula of this Pool, would apply in a general way at least to any other gas pool?

A Well, Mr. Dipple, I don't think it necessarily follows that deliverability would be applicable in any other gas field, no, sir. I am recommending specifically for the Jalmat Field, because my study leads me to conclude that this formula in this field would more nearly allocate allowables in proportion to reserves than the acreage formula does.

Q And you would not say that in your opinion, deliverability should be a factor in gas prorationing everywhere?

A Not necessarily, no, sir. Only where a study of that field shows that it does allocate in some reasonable relationship to reserves. If deliverability does accomplish that, then I think it has a place in the allocation formula. If it doesn't, and there are some fields that I am sure it wouldn't, then I don't think it would have a place in the allocation formula.

Q Then you wouldn't be willing to say at this time that the exhibits that have been offered in support of this application by Texas Pacific, would have application to the question of gas prorationing with respect to any other pool other than Jalmat?

A No, sir, it was certainly not my intent to convey that impression. There are certain engineering principles, I think, that

are pretty much universal, but it doesn't follow that deliverability is necessarily an appropriate factor in allocation of any gas field.

Q I believe I have only one further question. The testimony thus far, as I understand it, would show that the wells in the Jalmat Gas Pool have a capacity above the market demand, is that correct? The wells, as they are now, have a capacity above market demand, is that right?

A As a whole, I think that is true, although --

Q I mean as a whole.

A -- although there are, I believe the records show, that in 1956 there were 170 wells that couldn't produce their share of the market demand on the acreage allocation formula, or at least they didn't produce it.

Q But all the wells in the Pool, in whatever condition they are today, and in whatever manner they are producing today, have a producing capacity in excess of market demand, is that correct? In other words, the Jalmat Pool has a capacity to produce in excess of the market demand for gas from that Pool today, is that right?

A Yes, sir, if they are allowed to produce on a deliverability basis, that is correct.

Q Well, regardless of whether they are allowed to produce it or not, they have the capacity to today, do they not, to produce

at a rate in excess of today's market demand?

A Yes, sir, if they are not restricted by an allocation formula that reduces them below the market demand, that's true. What I'm saying is, Mr. Dipple, that it is fundamental to the hundred percent allocation formula that we have in the Pool now; that with a high demand, although less than the total capacity of the field, the acreage allocation formula by virtue of the fact that you have some wells that can't produce their assigned allowable on an acreage basis, serves to limit the take from the field.

Q Well, I suppose then your opinion is that they do not, under current conditions, have the capacity to produce in excess of current market demand, is that your testimony?

A No, sir, that was not my testimony. I said that they did, if they were allowed to produce on a deliverability basis and, of course, they are allowed to produce on a deliverability basis to a certain extent under the present allocation formula. That is, the wells that can't produce the acreage allowable, that are incapable of it, they produce up to their capacity.

Q Do you disagree with Mr. Nutter's testimony this morning that these wells are capable of producing in excess of market demand?

A I agree with it, except that I feel it's pertinent to put that qualification into it, that in order to do so, some of the

wells must produce on a deliverability basis, and some on an acreage basis, that you can't have each well produce on a uniform acreage basis, and meet the market demand, if it's high enough.

Q Mr. Keller, I don't want to quarrel with you. Then you do disagree with Mr. Hutter's testimony, is that right?

A No.

Q He didn't put any qualification on there. He said that the wells have a capacity in excess of market demand. Do you disagree with that?

A They have a capacity to produce in the aggregate in excess of the market demand, I agree with that.

Q Thank you. Now, let me ask you this final question. If deliverability is a factor, is put into proration formula as a factor, the fact that they have the capacity to produce today in excess of the market demand, wouldn't that then result in unnecessary workovers on wells to try to get further increases in the capacity of wells that now have a low capacity?

A I don't think so, no, sir.

Q You don't think so?

A No, sir.

Q You think all the operators with low capacity wells are just going to stand by and let the wells with high deliverability drain them?

A Mr. Dipple, I don't see how that follows from my answer at all. I don't think what you just stated.

Q You do not?

A No, sir.

MR. DIPPLE: Thank you. That's all the questions I have.

MR. PORTER: The hearing will recess until 9:00 o'clock tomorrow morning.

MORNING SESSION - FRIDAY, NOVEMBER 15, 1957, 9:00 a.m.

MR. PORTER: The meeting will come to order. Anyone else have a question of Mr. Keller?

MR. MALONE: Mr. Ross Malone. May it please the Commission --

MR. PORTER: Mr. Malone.

MR. MALONE: Ross Malone for Gulf.

BY MR. MALONE:

Q Mr. Keller, it may be appropriate to observe they change the jockeys, but they don't change the horses, however, they're carrying a little more weight this morning though.

In the study that you have made of the Jalmat Pool, did you have occasion to go into the early development of the wells which are now prorated in that Pool?

A No, sir, I didn't investigate that specifically.

Q Do you happen to know when the first wells that are now

being prorated in that Pool, were drilled?

A It's my recollection that there are a few real old wells in the area; real old gas wells that are now being prorated, Mr. Malone.

Q The early development was back in the early 30's?

A That is my memory.

Q There are a number of the wells over 20 years old being prorated in the pool at the present time?

A Yes,sir.

Q Now, did you have occasion to consider the percentage of development that has occurred in the Field at the present time; in other words, to what extent is the Field now developed, the Pool?

A Well, I haven't considered that problem specifically, Mr. Malone, but I feel like that it's substantially developed, as far as --

Q You would accept the figure of 90 to 95% developed at this time?

A Well, I don't know what figure is right, but it's for the most part substantially developed, yes, sir.

Q That development that has occurred, since we have had a proration formula and in the light of the proration formula, has been based entirely on acreage, has it not?

A No, I wasn't under that impression, I thought some of it,

as long as 30 years ago, I mean as long ago as back in the early 30's; so the development has been since that time, and as I recall, the proration started in 1954, wasn't it?

Q I believe you didn't understand my question. I said, that development since we had a proration and in the light of proration formula, was based entirely on acreage?

A Yes, however, I think that is a small part of the total development.

Q During the period of time that the development prior to proration in Jalmat occurred, there was not in New Mexico any proration formula which gave consideration to deliverability such as you have recommended, was there?

A In all of New Mexico?

Q Yes.

A I don't know for sure, Mr. Malone.

Q You don't know of any that did give such consideration, do you?

A No, or none that didn't. I just don't know.

Q Would you think it was a fair statement then to say that the Field has been 90 to 95% developed under situations, none of which took into account a proration formula that had deliverability in it?

A Well, I think a fairer statement would be that the develop-

rent took place up to 1954 under a situation where there wasn't any allocation formula, and since then it has been on 100% acreage.

Q And you would add to that that to the extent that proration occurred in oil fields in New Mexico, it was on an acreage basis?

A I didn't understand that question.

Q To the extent that we had proration in oil fields prior to gas prorationing, it was entirely on an acreage basis?

A In the oil fields, that is my understanding, yes, sir.

Q All I'm saying is that an operator going in and drilling a well prior to the present time, has no reason to take into consideration deliverability in the drilling and completion of that well, did he?

A Not since proration, no, sir.

Q And at no time prior to proration, he had no occasion to take deliverability into account?

A Well, Mr. Malone, I don't believe that's a correct statement at all. I think any operator when he drills a gas well, any prudent operator certainly takes into account the deliverability of the well when he completes that well. It has been my experience that any prudent operator, when he completes a well, will attempt to get as high a deliverability a well as he can under the circumstances. It is just axiomatic that we all try to get the best well we can.

Q Yes, but now let's assume the completion of a gas well which is obviously going to have a completion potential that is in excess of any proration or allocation that would be made to it, there is no occasion to frack that well and attempt to increase the deliverability, is there?

A Well, it's been my experience that we don't always, we are not always able to anticipate what the maximum take requirements for a gas well may be in the future, so it's been my experience that most operators will get as high deliverability as they can so that they can take care of the highest take that they may encounter in the future.

Q Now, that is based on your general observation, and not on any study of the completions in the Jalmat Pool, is that correct?

A That is correct, Mr. Malone.

Q You would not disagree with the statement that there have been many wells completed in Jalmat which were not fracked, since fracking has been available?

A That's probably right.

Q That's probably true. If they had fracked those wells, the deliverability of the well would have been increased very substantially, would it not?

A No doubt on some of them it would; not frack - fracking is not a hundred percent successful.

Q And if deliverability became a factor in the allocation of production, it would be extremely important to increase the permeability and hence to increase the deliverability as much as possible, wouldn't it?

A Well, I think it's important to do that, yes, sir.

Q And it would become much more important, if your recommendation were adopted by the Commission?

A In a sense, yes, Mr. Malone, of course. I think the past history has shown that it would have been important for a lot of the wells even under the present allocation formula, and I am referring to the fact that in 1956 there were 170 wells that failed to make their acreage allocation allowable; now, if those wells had been fracked and it had been possible to increase their productivity or their deliverability, there was a very strong economic incentive to do so under the present formula.

Q Now, you are speaking in the light of hindsight, are you not?

A And experience, yes, sir.

Q Well, in the light of hindsight in what has happened in the Jalmat Field, the statement that you have just made?

A I'm citing the experience in the Jalmat Field, yes, sir.

Q That is taken into account "hindsight", and what has happened in the last year there, isn't it?

A Oh, yes, sir, but that doesn't mean to say that a prudent operator couldn't have fracked in the first part of 1956. We didn't have to wait until now to know it would be important to frack.

Q Is it your opinion that any operator who did not frack on a completion of a gas well in Jalmat was not a prudent operator?

A Mr. Malone, that I think would depend upon the individual wells, and whether or not the potential possibility of increasing the deliverability was economically worthwhile. I certainly would not say that any well operator that failed to frack was imprudent, no, sir.

Q Certainly, I was sure that you wouldn't. You have agreed with me that there are a large number of wells which have not been fracked in Jalmat at the present time?

A I assume that is correct. I have not made a specific study of what wells have been fracked, and what wells have not been fracked, Mr. Malone. I don't know.

Q Let's compare that situation just a minute to the San Juan Basin. You referred to the fact that there was a deliverability factor in the formula in the San Juan Basin. It's true, isn't it, that that factor and that formula were included early in the history of the developments of those fields, so that the wells might be completed and the development proceeded on the basis of that

formula, wasn't it?

A Well, from what I know of San Juan, I believe that the development was not quite as far along at the time the allocation formula was adopted, as was the case in Jalmat.

Q That might be an ultraconservative statement, might it not --

A I think it is an accurate statement.

Q -- to compare the state of development in the San Juan Basin at the time this formula was developed, to the 90 or 95% development figure in Jalmat, there is quite a contrast there?

A Do you mean that the Jalmat Field was -- excuse me, yes, that is a contrast, yes. The Jalmat Field was further developed than San Juan in 1954 when the proration started, that is true.

Q So the fact that there might be a deliverability factor in the formula in the San Juan Basin does not necessarily mean that it could be applied with equal fairness in a field 90% developed before it was applied?

A That is certainly true. I do not mean to say that the 75, 25 percent deliverability formula that I have proposed is fair in Jalmat, because it is being used in San Juan. I don't think that's quite right.

Q You don't take that position?

A No.

Q Thank you. Can you give us an approximate figure on the

cost of fracking a well in the Jalmat Pool?

A I haven't made any estimates of that.

Q Would you accept a figure of between 5 and 10 thousand dollars?

A I think that's reasonable, yes, sir.

Q Referring now to your formula on deliverability, the "K" which you have included to indicate permeable deliverability is a direct function of that "K", is it not, that is to say if you double the permeability, you are going to double the deliverability?

A All other factors being the same, that is true, yes, sir.

Q It is also true that there may be a greater variation in the permeability factor in that formula than in any of the other factors in it. In other words, you can't change the thickness of pay, you can't change the quality of the pay, you can't change the pressure very much, but you can change the permeability quite a bit by fracking, can't you?

A Yes, sir, the permeability variation probably covers a wider range than the other factors.

Q Could you give us -- oh, beg your pardon, go ahead, I'm sorry.

A The fracking of course not only changes the permeability, but it also changes the distribution of permeability, that is, we generally think that the fracking changes the permeability within

the immediate vicinity of the well bore, but not too far distant away from the well bore; so the fracking, in referring to the deliverability formula on my Exhibit 7, not only changes the "K" but it also changes that constant value which takes into account the geometry of the permeable distribution in the formula. We assume that the permeability distribution is constant throughout the area which has been depleted by the well, the fracking changes that situation.

Q The fracking does change it?

A Yes, sir.

Q Could you give us an estimate of the order of magnitude of such a change that might occur as a result of a successful frack job, would it be 10 times, 20 times, 50 times, the permeability before the frack job, five times, two times?

A Well, sir, I don't have any way of estimating the effect of a frack job on the permeability as such. Now, we do have information generally as a result of frack jobs where we compare the rate of production or the deliverability before and after a frack job, and I think that two or threefold might be within reason.

Q Well, it isn't unusual down in that area to have a well that would deliver half a million cubic feet before a frack, and 8 or 10 million after, is it?

A Well, I haven't made a specific study of the results of

frack jobs in Jalmat, Mr. Malone, so I don't know whether I can answer that or not.

Q If a frack job would increase the deliverability from a half million to five million cubic feet, let's say, to be conservative, that would be an increase of ten times, wouldn't it?

A From a half a million to five million?

Q Yes.

A Yes, sir, that would be a tenfold increase in deliverability.

Q Would you say that is a likely, or unlikely condition after a successful frack job?

A Well, I think that such results are certainly possible, and are not beyond the realm of reason. I do feel, however, that when we do obtain such large increases in productivity, that one reason for it is that there was some damage to the well bore, some plugging of some nature prior to fracking, and that all the benefits can't be attributed strictly to improving the permeability, that the well was already not efficiently completed before frack.

Q So that you feel an increase of say 10 times in the productivity of a well indicates in your formula a change in "K", the permeability, and some change in the efficiency of completion?

A Yes, sir.

Q You would attribute it to those two factors?

A Yes, sir.

Q That frack job doesn't change the net pay thickness, does it?

A No, sir.

Q It doesn't change the pressure does it, not appreciably, at least?

A No, sir, it doesn't change the pressure.

Q It doesn't change the quality of the pay, does it, other than permeability?

A That's right, excepting in the sense you create some additional permeability.

Q And to the extent that the situation might exist that you referred to where you get a bad completion, and some sealing off; it doesn't change the efficiency of completion?

A The frack job doesn't?

Q Yes.

A Oh, very definitely it does. That is what it does do.

Q You mean that you think it is a greater change in the efficiency of completion than in the permeability? You put both of those in your formula, you know. Are you reflecting the same influence twice when you do that?

A I would say this, that when you create permeability, you change both the permeability and the efficiency of completion, yes, sir.

Q I would certainly agree with you, but the change in efficiency of completion results in the change of permeability, primarily, doesn't it?

A I think that's right, yes, sir.

Q Now this confusion of permeability in here, if you double the permeability, you double the deliverability, don't you, in your formula?

A Yes, sir.

Q If you quadruple the permeability, you quadruple the deliverability, don't you?

A All other factors being the same.

Q And if we use the example I just mentioned from a half a million to five million, we would increase the permeability by ten times, and increase the deliverability by ten times, wouldn't we?

A Well, we certainly would increase the deliverability by ten times, that was our basic assumption, but whether or not the permeability was increased by that same proportion, that is permeability of the rock, I don't believe we can definitely say, because the low deliverability of five hundred might not reflect the true permeability of the rock itself, because as I said, after plugging effect, and also because the high deliverability test would not reflect the permeability of fracking 100% because you also change the geometry of flow, because you have changed the distribution of

permeability.

Q What you are saying, if I understand you, is that you don't want to attribute that increase of ten times of deliverability, which resulted from the frack job, to deliverability, but you want to attribute it to the C-2 part of your formula, and to the completion?

A Yes, I think that is right.

Q When we get that increase of ten times in deliverability, that is the deliverability factor that you are going to give, 75% times the acreage in your formula? That is, that deliverability factor?

A Yes, sir, if the five million and half million are measured under the conditions of 80% flow, against 80% of the shut-in pressure, that is true.

Q When we did that, when we increased that deliverability factor, that was going into your formula, we didn't increase the thickness of the pay, did we?

A No, sir.

Q We didn't increase the pressure?

A No, sir.

Q We didn't increase the quality of the pay, other than it's permeability?

A No, we assumed that we didn't do all of that to start with.

Q We didn't increase the recoverable gas in place, whether recoverable or not, did we?

A No, we assumed that too, to start with.

Q So in that example, we have a situation in which the deliverability figure that is going into your formula, is increased ten times, even though the reserves have not been appreciably increased, don't you?

A That is true in that example, Mr. Malone, and I thought I pointed that out as clearly as I could in my direct examination, that the permeability enters into the determination of deliverability in an entirely different fashion than it enters into the determination of the Recoverable Gas in Place, and it was for that purpose that I prepared Exhibit 7, and had some numerical examples showing that if you double the permeability, you double deliverability, which would only change the gas in place by changing slightly the recovery efficiency, but you only change the gas in place.

Q So that is a respect in which your formula of including deliverability has no relation, no appreciable relation to reserves at all, does it?

A Oh, yes, it has a relationship to reserves.

Q Well, a relationship in the economic life of the well, the period during which production may be economically continued,

but that's all, isn't it?

A Mr. Malone, in the hypothetical example that we just discussed, what you say is true, but it does not follow that that is true in the Jalmat Field; to the contrary, my studies of the Jalmat Field lead me to conclude that in general the higher deliverability wells have higher reserves.

Q Is that a condition which you are prepared to say exists uniformly throughout the Jalmat Field?

A No, sir, nothing exists uniformly throughout the Jalmat Field except acreage.

Q Exactly; exactly; thank you very much, Mr. Keller.

A And the proportions or the relative distribution of reserves are far from uniform, and are very close in general to the distribution of the formula that I have recommended. That is why I have recommended it.

Q Now, for the purpose of taking an actual example, and I'll try not to use your slide rule too much this morning, but let's assume two wells down in the Jalmat Field, neither one of which were fracked on completion, and that all conditions in the two wells which enter into your formula are the same; our acreage is 1 to 1; our permeability is 1 to 1; our reserves are 1 to 1.

Then let's assume a frack job on one of those wells, and not on the other well. I believe that you agreed with me that a 1 to

10 or a ten times increase in permeability would not be an unreasonable assumption. Let's say from 30 millidarcies to 300 millidarcies as a result of the frack job, the change in permeabilities.

A What was the question, Mr. Malone?

Q The question is: Would you accept the 1 to 10 as a possible result of the frack job?

A Possible, but I certainly wouldn't say it is an average situation; it would take some unusual circumstances, I think to get that.

Q For the purposes of this example, let's use the 1 to 10 since that is the way I have got it worked out.

A That is on deliverability, now?

Q On deliverability or permeability, as you prefer it.

A Which is it?

Q Let's take it on deliverability?

A All right, sir.

Q What change is that going to make in the reserves in the recoverable oil in place, this frack job? Would you just compute that for us, or I can give you a figure, and see if you can accept it as an increase from 1 to 1 between the two wells to 1 and 91/100ths. In other words, we have a 9/100ths increase as a result of the economic change in the economic life of the well.

A We are going to assume that the well with the tenfold in-

crease in deliverability has a 1.1 reserve --

Q Well --

A -- compared to 1 on the other well?

Q No, it is 1.09.

A I'm willing to assume that.

Q So that, by this frack job, there was an increase in the recoverable gas in place from 1 to 1.09, and we have two wells, one of which has the component 1 representing it's reserve, and the other one has 1 and 91/100ths. Let's apply that increase in deliverability to your proration formula and see how much increase there would be in the production allocated to that well, after the frack job.

A Mr. Malone, you'll excuse me for taking so much time, but I made a mistake in arithmetic yesterday; I am trying not to repeat it.

Q Well, I'll tell you, I have a pony here that I'll give you the benefit of, and it comes out 1 to 3. In other words, a threefold increase in allowable.

A Mr. Malone, I have checked it with a cohort, and done it two different ways, and I calculate that the allowable under the 75, 25 percent formula, under this hypothetical example, that we are using here, would be 4.2 on the 10 deliverability well, compared to 1 on the one deliverability well.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
November 14, 1957
and
November 15, 1957

IN THE MATTER OF:

CASE NO. 1327

TRANSCRIPT OF PROCEEDINGS

VOLUME 2 - CONTINUED

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Q I like your figures better than mine.

A I believe the 4.2 is correct under the assumptions that we have made.

Q Then, if I understand that result, it means that if the Commission adopts the formula which you have recommended, and with these two wells side by side, which have the same recoverable gas in place, and one of them did a frack job and the other not, it's allowable would increase four times, as compared to the allowable of the well that was not fracked, or 4.2 times, that is correct?

A If the Commission were allocating this hypothetical example on the basis that I have recommended, that is correct, yes, sir.

Q And that increase in the allowable of that well would occur without there being any increase whatever in the recoverable gas in place under that well, wouldn't it?

A Well, I understood that we had assumed in our example the increase would be 10%.

Q Well, no, we -- well on the recoverable, you have got me. You are right. It is to the extent that it is recoverable and the life of the well is extended, there would be a 10% increase in reserves, and a 400% increase in allowable, is that right?

A For that well, yes, sir.

Q As against the 100 or factor of 1 for the other well.

Now, compared to that situation under the present allowable formula, based solely on acreage, we get a 1 to 1 basis, do we not? In other words, whether the man fracked or not, he gets an allowable which, if the well is capable of producing it, it produces and that's all?

A Under the present allocation formula, it's 100% acreage, yes, sir.

Q And the result that we have reached there of a 400% increase in allowable with no increase in reserves, would be proportionately applicable all over the field, depending on the percentage of increase you got in your permeability from a frack job?

A No, sir, I don't agree with that.

Q In what respect do you disagree?

A I don't think that this hypothetical example is anywhere near representative of what the condition all over the field is in Jalmat.

Q In what respect is it not representative?

A It is not representative in practically all respects.

Q Let's take them one by one.

A We have assumed that the net pay thickness was the same for each of these wells. My studies of the field show that this is not true. We have assumed equal pressures, my studies of the field show this is not true. We have assumed equal all of the

factors in the wells we are comparing between number 1 and 2, except a frack job, and this is certainly not representative of the Jalmat Field by any stretch of the imagination.

Q We made that assumption, Mr. Keller, just to save your slide rule. It would get a good deal more complicated if we started using different relationship between the two wells.

A Yes, sir.

Q But the same computation would have to be made, wouldn't it, and the same change in deliverability would be reflected as a direct function of permeability, or vice versa?

A Yes, sir. Mr. Malone, I'm perfectly willing to agree to the results of this hypothetical example, but I am not willing to agree that in this case the result in the Jalmat Field would be something, because this is just not the Jalmat Field by any stretch of the imagination.

Q Would you agree with me that it is indicative of a change in the allowable that would accrue under your formula, when there is a tenfold increase in permeability?

A In a situation where all other factors are equal, yes, sir, I have agreed to that.

Q And if those other factors aren't equal, it only changes the relationship between the two wells. It changes the 1 to 1 that we started out with, to maybe 1 to 3, but the deliverability

in your formula is going to change in the change in permeability, regardless of what we start out with?

A Well, it just changes completely the application of my formula to the field. It is entirely different than this hypothetical example. That is all it changes.

Q Are you saying, Mr. Keller, I don't want to misunderstand you, are you saying that because we didn't start out with equal conditions in two wells for a hypothetical situation, that the tenfold change in permeability would not result in a tenfold change in deliverability, and hence, the same change percentagewise in the allocation of production --

A Under --

Q -- under any condition in that field?

A I'm just saying that the condition that we assume in this example are not representative of the Jalmat Field. I am agreeing with you that all other factors being the same, if you change the deliverability tenfold, that under the formula recommended by me, 75, 25, the allocation of allowable would be 4.2 to 1, although the recoverable gas in place would be 1.1 to 1.

Q Do you also agree with me that regardless of whether these other factors are the same or not, that deliverability in your formula is a function of permeability and regardless of what the other factors are, when you multiply the permeability by 10, you

are going to have to multiply the deliverability by 10, and get a tenfold greater deliverability?

A All other factors being equal?

Q No, I'm not saying all other factors being equal. I'm saying regardless of the other factors, permeability is --

A (Interrupting) That's right.

Q And when you double permeability, you double deliverability, and when you make it tenfold, you make deliverability tenfold, regardless of the other factors?

A That is true, if you don't change the relationship between the other factors. They might necessarily not have to be the same, but so long as the relationship hasn't changed, that is true.

Q Whatever you do to the rest of the formula, you still, when you work it out, you have to multiply by that permeability function, and if it is two, you are going to double it?

A That is right, my formula is acreage times deliverability. If you double deliverability, you double the acreage times the deliverability factor, provided, the acreage stays the same, that is true.

Q I think we are in agreement then, if I understand you, that even though all of the reserves in the Jalmat Field are not the same, and however, they may vary, and however the various factors that go into them may vary, when you quadruple the permeability,

you quadruple the deliverability, under your formula? We are in agreement as to that, are we?

A Subject to the qualifications we have already stated, yes, sir, we are in agreement.

Q Well, I think we understand each other. Now, referring for a moment to the statement which you made yesterday with reference to the effect on your formula if all of the wells are on the same size acreage, or have the same number of acres attributed to the wells, then acreage goes out of the formula, doesn't it? In other words, if all the wells in the Jalmat Field were drilled on 160-acres, acreage goes completely out of your formula, and deliverability determines the proration allowables entirely?

A That's true, and by the same token, if all the deliverabilities are equal --

Q Now, if it is true --

A -- the deliverabilities are washed out.

Q If it is true, as indicated by the last proration schedule, 74% of the acreage in that field is attributed to wells in 160-acre units or 289 of the 375 wells, roughly, which is a 77% figure, that between 74% and the 77% of the field would be prorated entirely on deliverability under your formula?

A No, sir; no, sir, that's not correct.

Q That isn't correct?

A No, sir.

Q Maybe I misunderstood you yesterday; I thought you said if the acreage was equal, the acreage portion of your formula goes out, and deliverability is all that is left to determine the allocation of production?

A As to 75% of the allowable; 25% is still on acreage.

Q But if the acreage is the same, it cancels itself out, or washes itself out?

A No, it does as to the 75% allocated on the acreage, times deliverability basis; but it doesn't wash out as to the 25%, that's still on 100% acreage basis, see?

Q But if you multiply -- if you use the same multiplier as to all extremes, doesn't it wash itself out and leave the deliverability as the sole basis of allocation?

A No, it doesn't.

Q It doesn't?

A No. Maybe I don't make myself clear, but what I am saying is even though, as to the wells that all have 160-acres assigned to them, that as to those wells, the deliverability factor washes -- no, the acreage factor washes out as to those wells in respect to that part of the formula that is governed by acreage times deliverability, see? So, and which is 75%, so you are perfectly right there as to that part of it, but the other 25% has no deliverability

to start with, so it can't become 100% deliverability, even though the acreage of the wells we're considering is equal.

Q Wouldn't the allowable vary directly with the deliverability, even so?

A No, sir.

Q They will not?

A No, sir.

Q Any way, we can agree as to 75% of the formula, it will be entirely deliverability?

A Under the -- as to those wells that all have the same acreage assigned to it?

Q They would all have 160 acres.

A Yes, sir, with one -- well, now, there is one exception there; if any of those wells are marginal wells, that is can't make the allowable, then they will be 100% on deliverability either under the formula that I propose, or the current formula.

Q Right. Well, I'll certainly accept that exception. Just one other thing; I would like to go back for a minute to your discussion of the proration formula there in which you referred to the fact that perhaps some of the effect resultant from a frack job should be attributed to a change in the efficiency of completion, rather than to a change in permeability.

Is that of particular consequence one way or the other in the

answers that you made, or can we button it up by saying that it is reflected in deliverability whichever it comes from?

A Well, the frack job is reflected in the -- yes, sir, that is correct, the results are the same regardless of what the causes are; that is true.

Q In your formula, I don't actually have a figure reflecting the efficiency of completion. The C-2 figure, isn't that temperature and viscosity?

A Yes, sir, that is just a constant.

Q So that we would have to, for your formula, attribute the entire change to a change in permeability?

A What change are we speaking about?

Q The change which results from the frack job; in other words, the increase in deliverability that results from the frack job?

A Back to the hypothetical example now?

Q Yes, that's right.

A That's essentially true, although maybe not rigorously true from a scientific standpoint.

Q For the purposes of your testimony here, it is probably adequate?

A It is essentially, yes, sir.

MR. MALONE: That is all.

MR. PORTER: Anyone else have a question?

MR. McCARTHY: Pat McCarthy, Permian Basin Pipeline Company.

BY MR. McCARTHY:

Q Mr. Keller, yesterday afternoon Mr. Dipple, representing Continental Oil Company, questioned you at some length as to your opinion of the use of deliverability in formulas in the pools other than the Jalmat. You testified that there might be pools where the use of deliverability in the proration formula might not be proper, is that correct?

A Yes, sir.

Q Did you have any specific pools in mind when you said it might not be proper?

A No, sir, it was just a general observation that could be true.

Q I see. Well, Mr. Keller, does the Eumont Pool join the Jalmat Pool?

A Yes, sir.

Q What formations are productive of gas in the Jalmat Pool?

A Well, the Yates and the Seven Rivers.

Q I see. What formations are productive of gas in the Eumont Pool?

A I believe it's Yates and Seven Rivers.

Q I see. So you have the same formations producing gas in

pools that join each other, is that right?

A Excuse me?

Q I say you have the same formations producing gas in pools that join each other?

A Yes, sir.

Q Well, in your opinion, is that reason to believe that deliverability might properly be a factor in the proration formula for the Eumont Pool?

A You mean just because they produce from the same formations, and join each other?

Q Yes.

A That in itself, no, sir. My criteria for saying, or forming an opinion whether or not an allocation formula would be proper, would depend upon whether or not that formula reasonably distributed the allowables in proportion to the reserves.

Now, for example, let us assume that that was not the case after studying the Eumont Field; then I would certainly conclude that the deliverability was not applicable to that field. On the other hand, if a study of the Eumont Field showed that the deliverability factor in a formula such as I have proposed at Jalmat, did reasonably distribute allowables in proportion to reserves, then I would conclude that it was proper.

Q Well, do you have any reason to believe that deliver-

ability should not be a factor in the proration formula for the Lumont Pool, or any other Lea County Pool?

A I haven't made a study of these other fields in respect to what would be in my opinion a proper allocation formula, so I don't believe that I can answer that.

Q Well, you can answer it to this extent that you don't have any reason to believe that it would not be proper, is that true?

A Well, that is true. But to be perfectly honest, I don't have any reason that it would be proper.

Q I see. Mr. Keller, you have referred in your earlier testimony to deliverability as used in the proration formulas, for the Tri-State-Hugoton Field.

Do you know if that formula has been satisfactory to the producers and purchasers in that field?

A Not specifically, no, sir, I haven't polled the producers and operators to find that out.

Q Well, have you any general information?

A Well, all that I can say about that is, to my knowledge it's been in effect quite a number of years, and if it's been challenged, I don't know about it, so one might could assume that it has been satisfactory.

Q Well, then, on the other hand, you don't have any reason to believe that it is unsatisfactory, the fact that it has been

in use?

A Well, if it hasn't been challenged, then it must be suitable to people, would be reasonable, I think.

Q Do you know of any hearings in recent years, before any of the three State Commissions involved in the Tri-State-Hugoton Field, where anybody protested the use of deliverability in the proration formula?

A I'm sorry, sir, I really don't follow gas proration to that extent. My primary work is in engineering, and I just don't follow proration to that extent to know that.

Q Well, I don't know whether you can answer this then either; but did the introduction of deliverability type formula in the Hugoton Field cause what is known as the acid raise or frack raise, do you have any information on that?

A Well, I did know that there has been that fracking in the Hugoton has been successful, and I do know, or I have the impression that it has resulted in being able to extend the field limits; that is, because of the additional deliverability afforded by the effectiveness of the frack job, it is possible to economically drill wells out on the edge that weren't economical before fracking. I did understand that is true. It has been a waste preventative measure from that standpoint.

Q Mr. Keller, do you know if some of the producers in the

Jalmat and other Lea County Pools, are also producers in the Hugoton Field?

A I'm sure that they are.

Q Well, one final question then. I believe you agreed with Mr. Malone that a frack job would run between five and ten thousand dollars, I think you agreed with him. Do you have any statement on the cost of a wellhead compressor?

A I'm sorry, I don't.

Q Would you say a figure in the neighborhood of $20,000 might be reasonable?

A Oh, I would think that to evaluate what would be reasonable, you would have to know what pressures were involved, and what volumes were involved. It would be reasonable for a small compressor, yes, sir.

Q You don't think then that $25,000 would be pretty much of an average for a compressor?

A I don't believe I have enough information to answer that question. It depends on how much gas has to be handled, and what pressures.

MR. McCARTHY: I see. That's all.

MR. PORTER: Mr. Howell.

MR. HOWELL: Ben Howell, representing El Paso Natural Gas Company.

BY MR. MORRIS:

Q Mr. Keller, I'll direct your attention to some of Mr. Hinkle's questions yesterday afternoon, and for the sake of clarifying just what we mean, let's assume that the two wells belong to Mr. Hinkle, and we'll name the Hinkle Number 1, the well with the 500 pound pressure; and the well with the 1,000 pound pressure, we will name the Hinkle Number 2.

A Yes, sir.

Q Now, if all factors are equal, as I believe Mr. Hinkle's questioning implied, and these wells are in the same reservoir, would you not conclude that the Hinkle Number 1 with it's 500 pound pressure, has already produced a substantial amount of the recoverable gas reserves underlying it's acreage?

A Yes, sir, it's just further depleted than the Number 2 well, which has a thousand pounds of pressure.

Q And that where in the same reservoir you find substantial differences in pressure that usually is the result of partial depletion, and the fact that one well or several wells have produced already a portion of their reserves?

A Yes, sir, there is a disproportionate production of their relative reserves accounts for the difference in pressure.

Q Now, then, let's say that instead of that being the Hinkle Number 2, with the thousand pound, that should be the Keller Number

l then in order for you to get your fair share of the reserves, with your thousand pound pressure you would have to be permitted to produce at a greater rate than the well that was already partially depleted, would you not?

A Yes, sir, because the direction of the migration, assuming they are in the same reservoir, I suppose would be from the high pressure wells towards the low pressure well.

Q And then am I correct in concluding that where differences in deliverability are attributable to pressure, that failure to give to the higher deliverability wells a larger allowable, would result in the low pressure wells draining gas from the area surrounding the high pressure wells?

A Well, that's certainly true, and in this hypothetical example we are discussing, it would certainly follow, I think, if you will analyze it, that the formula that I recommended would be far from adequate in that it would not assign the higher pressure well enough allowable so that it would have the opportunity to produce it's reserves from that standpoint.

Q But the formula which you have recommended does less violence to the doctrine of correlative rights than a formula based on straight acreage under those circumstances, would it not?

A Yes, sir, it would be a considerable improvement over acreage in the hypothetical example, but it would still, I believe,

fail to protect the well with the higher pressure.

Q Now, in your studies of the Jalmat Gas Pool, did you ever find conditions in which certain wells have depleted a large portion of the reserves attributable to those wells?

A Yes, sir, I found a fairly large variation in the amount of gas produced between wells, and also as to their current pressures.

Q There is a difference, over the period of 30 years, in the dates of completions of various wells in the field --

A I think that is substantially right, yes, sir.

Q -- so that in your study, you found many wells which have already produced a substantial part of the recoverable gas reserves attributable to those wells?

A Mr. Howell, I haven't specifically tried to analyze the answer to your question in the Jalmat Field, so I would think that there would be instances like that, but I can't point to one specifically.

Q But you did find --

A I haven't tried to answer that question in the Jalmat Field, specifically.

Q Thank you, Mr. Keller, but did you find wells with different pressures?

A Yes, sir.

Q And as a result of the study that you made of this particular field, you came out with the formula which you are recommending to the Commission?

A That is correct.

MR. HOWELL: Thank you, that's all.

MR. DUTTON: Granville Dutton, Sun Oil Company, Dallas.

BY MR. DUTTON:

Q Mr. Keller, could I direct your attention for a moment to Exhibit 7, labelled "Gas Reserves". Up under Roman numeral one, if we should strike this, to strike the word "Recoverable", which of the sub-headings will fall out from the Gas in Place, which would be entitled for that particular heading?

A Well, I believe that the permeability would fall out because the disarrangement, the Gas in Place just the recovery efficiency, and I believe that the efficiency of completion would fall out.

Q I see. Directing your attention to Number 2, Net Pay Thickness; under one, I believe that you testified yesterday under cross examination that under one, that that would be the total Net Pay Thickness that the well bore penetrates, is that correct? The term "Gas in Place, you use to total Net Pay Thickness that the well penetrates?

A Yes, sir.

Q Whereas in Number 2, if I understood the testimony on cross examination correctly, Net Pay Thickness actually, as referred to deliverability, applies mainly to how much of the formation is open to the well bore, did I understand that correctly?

A Yes, sir.

Q With respect to Number 3, Pressure, on the left hand side I believe that we stated that this pressure was a static pressure, or shut-in pressure, and that the reserves were in direct proportion.

Well, now, since there has been some confusion on the word "reserves", let me rephrase that, that the Gas in Place is directly proportional, to this static pressure in determining the volumetric calculation?

A All other factors being equal, that is correct.

Q Now, with respect to Number 3 on the right hand side, labelled "Pressure", I believe that this pressure enters into your formula as a differential of squared pressure, raised to a power, which you have recommended .8, is that correct?

A Yes, sir.

Q Now, in the light of these changes, if the Exhibit were labelled as we have now assumed, "Gas in Place" versus Deliverability, I don't believe there is a single item on the left side which coincides with an item on the right side, is that a fair

statement?

A No, sir, I don't believe so. I thought we just agreed that both Net Pay Thickness and Pressure would still appear on both sides.

Q They would appear, but didn't we agree with the qualification on the left side in the total Net Pay penetrated by the well, and on the right side it is the amount of pay open to the well bore?

A Oh, yes, sir. Now, we agreed that they would both be on both sides, but they would enter into the determination of Gas in Place in a different fashion than they entered into the deliverability, and that was the reason that I prepared Exhibits A, B, C, and D to illustrate that these factors did do that.

Q But you do agree that the numbers used would actually be different, just as you have stated the number of the Net Pay Thickness?

A Number for what?

Q The number for Net Pay Thickness, in determining Gas in Place would differ in the number used for Net Pay Thickness under determining deliverability in the same well bore, unless you had every single foot of pay open to the well bore?

A I'm sorry, I can't agree to that statement.

Q All right, sir, correct me.

A First of all, the Net Pay Thickness isn't used to determine the deliverability. It enters into the deliverability, but the deliverability is determined by a well test; and, second of all, what you said about the total Net Pay entering into the determination of the Gas in Place with only half of it entering into the determination of deliverability, is true only under the limitation that half of it is perforated.

Q Well, I didn't mean to get down to actual numbers, but it's true only to the extent that it is perforated, without putting in actual numbers, or open bore, is that not true?

A Well, sir, to be strictly scientific, it is not exactly true, but you have some spherical type flow if you perforated all of it, see, but for the purpose of this, I'll agree that it is essentially true, yes, sir.

Q Then the only point that I'm making here is that the number that would be used in Net Pay Thickness on the left is different than what would be used in the Net Pay Thickness on the right, except in a very limited circumstance which we have just gone over, that being that the amount of pay open to the well bore is equal to the total amount of pay?

A Maybe we are in agreement, and I don't understand it; actually, we don't use Net Pay Thickness in determining deliverability. We measure that from the well.

Q What is the purpose of Exhibit 7 in showing Net Pay Thickness on both sides? Does it intend to give the connotation that Net Pay Thickness used to determine Gas in Place is also a function that would determine deliverability? I am trying to make the point that it is a total Net Pay Thickness. Do you disagree with that statement?

A It could be a different Net Pay Thickness. I certainly have no intention of trying to convey the understanding that these factors entered into both Recoverable Gas in Place and into Deliverability in the same manner. I tried, to the best of my ability, to point out by Exhibit 7, A, B, C, and D, that they entered into the determination of Recoverable Gas in Place, and ability to produce in a somewhat different fashion, but they did have this relationship that if they were greater, if any one of the factors were greater, it would tend to cause both deliverability and Gas, Recoverable Gas in Place, to be greater, although not in the same proportion.

Q In fact, when you say that you use them in a different manner, you mean that you are using different numbers in a great majority of cases, except for a very limited set of conditions?

A No, I don't mean that. To my mind, you are using the same numbers entering into the determination of both Recoverable Gas in Place, and Deliverability, with the few exceptions as you have

pointed out, where you might not perforate the whole pay section.

Q I believe you are twisting my words around, I'm pointing out that it is only a very limited set of circumstances that you would use the same numbers?

A That is what I am disagreeing with you; I think that what you are calling the general case, is the exception.

Q Is it your opinion that the general case in the Jalmat Field is that every single well down there, or let's say that the great majority of the wells down there, have their entire Net Pay Section open to the well bore?

A I haven't made any specific study in that respect, but it's been my general impression that in completing gas wells, unless there is danger of water, that most prudent operators open up the entire pay section.

Q In this study that you have related deliverability, and shown these formulas both having Net Pay Thickness, you did not make a study to determine if Net Pay Thickness entered in the same manner?

A No, in my studies of deliverabilities, I studied the deliverabilities from actual tests, as we won't calculate deliverability using Net Pay Thickness.

Q Then the Exhibit 7 is in no way designed to indicate that deliverability, the functions that go into the calculations of

deliverability, or that make up deliverability, the physical factors of the reservoir, these same physical factors do not enter into the Gas in Place computation at all?

A Yes, sir, they do enter into it.

Q In what manner?

A That is what Exhibit 7 very definitely shows, that these same factors do enter into both the Recoverable Gas in Place, the value of it, and into the deliverability; although in a different fashion. It also shows that acreage is the only factor in the allocation formula, although there are four other factors that enter into the determination of the Recoverable Gas in Place, and those four other factors have their effect on the deliverability, although in a somewhat different fashion. That was the whole point I was trying to make by that Exhibit.

Q When you say, "somewhat different fashion", as much as I dislike a hypothet, you have admitted that you have testified that the Net Pay Thickness on the left was the total productive interval; you have admitted that the pressure on the left was static, and in direct proportion to the volume of Gas in Place on the right; you have admitted that Net Pay Thickness is the pay thickness open to the well bore; you have admitted that the pressure on the right is the differential of a square pressure which enters into formula only when raised to A power. Are those the same

numbers, if you were going to theoretically calculate these, can you answer that question "yes", or "no", if the same numbers would enter a theoretical calculation?

A Well, sir, if you will, on the bottom of Exhibit Number 7 are some mathematical equations which I have tried -- which express the relationship that these factors bear to both Recoverable Gas in Place, and to ability to produce.

I certainly agree that in case of where not all the Net Pay is perforated, if you were trying to calculate theoretically the deliverability, you would conclude as the thickness only that it is perforated and in that respect the number would be different than if you are calculating the Recoverable Reserves in Place.

It is true, by the equation that I have on the Exhibit there are two pressures involved, one is the shut-in, and one is the working, and the Recoverable Gas in Place there is only the static pressure; actually, to be rigorous, it would be the average pressure in the reservoir. I think that is correct, yes, sir.

Q Now, in your opinion, would the formula that you have recommended to the Commission, protect correlative rights?

A In my opinion, the formula that I recommended more nearly, or to a greater extent, protects correlative rights than the 100% acreage formula.

As a practical matter, I don't suppose there is any perfect

formula that would distribute allowables in direct proportion to reserves, or Recoverable Gas in Place.

I mean, it's just not possible, but it is my very definite opinion, based on my studies in the field and my understanding of the operation of the allocation formula, that the formula that I have recommended goes a great deal further toward protecting correlative rights in general than does the 100% acreage formula. It is for that reason that I have recommended it.

Q Would you state to the Commission, your conception of what an allowable formula must contain in order to protect correlative rights?

A Well, sir, in my opinion, an allowable formula must result in the distribution of allowables in some reasonable proportion, or some reasonable relationship to reserves in order to protect correlative rights.

Q Would you define for the Commission, "Reserves" in your opinion?

A The reserves of a well, of a gas well, is that volume of gas which will be produced in the future from such well.

Q Under what conditions in the future?

A Whatever conditions exist in the future.

Q Can you expect the Commission to know what conditions would exist in the future?

A Well, as an engineer, in estimating gas reserves, it's common practice to anticipate the future on the basis of the past.

A common method of estimating reserves for gas wells is by means of a material balance performed graphically by plotting Pressure versus Cumulative Production, and extrapolating that curve. That is, I think, a well accepted commonly used method of estimating gas reserves.

Q Have you estimated the gas reserves in the field, I'll say at the inception of production and before the technical advance of fracking, and acidizing, would you predict the same recoveries that will now occur under the known technical procedures that are known today?

A It would be highly coincidental.

Q I would like to suggest an alternative definition of correlative rights used in a number of cases, and see if you object.

This would involve giving each mineral owner an opportunity to recover his share of the hydrocarbons beneath his property.

Would you have any objection to that definition of correlative rights? Not to appear that I'm attempting any entrapment, I would like to point out that I am using the present tense, the hydrocarbons under his land, as Mr. Howell brought out a moment ago; perhaps the well that now has 500 pounds might have produced more than the well that has 1,000 pounds on equal acreage tracts, but

even with that in mind, do you think that is a fair statement of the protection of correlative rights?

A Well, I think -- what do you mean by his share?

Q Well, I mean his share of the hydrocarbons beneath his land, or the equivalent thereof.

A Well, to my mind, that definition should be supplemented and it is necessary to do so for an engineer to evaluate whether or not correlative rights are being protected. I have got to set a standard by what you mean by "his share", and the standard that I have used is the reserves for those.

Q But by "reserves", you are including a recovery efficiency, are you not? You have defined it as that gas that will be recovered. There is so much In Place to determine Reserves as you defined it necessitates assuming it, or basing it, on past experience, a recovery factor?

A No, sir. I don't know the recovery factor when I estimate the reserves of these wells necessarily. The assumption that I make in doing that is that the recovery factor over-all is the same.

Now, that is done by assuming an abandonment pressure for each well, and in estimating reserves I have assumed the same abandonment pressure for each well.

Q In the definition of correlative rights that I have given you, notice that I have said that each interest owner has an oppor-

tunity to recover - that opportunity, would you not think, included the privilege to increase his efficiency of completion, and with the Commission's approval, permission to institute any type of pressure maintenance or flooding project that he would so desire?

A Well, sir, I certainly couldn't recommend a flooding program in the Jalmat Field, or pressure maintenance that wouldn't be reasonable, to my mind.

Q In 1930, would you have recommended fracturing a well in the Jalmat Field? This is a dynamic business, as you probably know, as well as most of us.

A Let us answer that question this way. I couldn't have, because I was in High School, but that idea had been proposed at that time.

Q Well, but you in High School, wouldn't have known it, is that right?

A That's right.

Q Well, the point, you are basing this recoverable reserves that you think deliverability is a function strictly on what has happened in the past, am I correct in that statement?

A The word that bothers me is "strictly".

Q What else are you basing it on?

A Let me say this, that as an engineer, given the problem of determining an allocation method which will serve to protect cor-

relative rights, it's necessary that that engineer first of all set up some basis, or standard which he can quantitatively measure one formula against the other; for that reason, it was necessary to adopt some standard in my thinking of what "fair share" was.

It was my conclusion, after considering that problem, that the reserves of the wells, and of the acreage assigned to them, was not only the best, but in actuality was the only real standard with any meaning that you could use in this particular situation.

Q Why did you reject Gas in Place?

A Because it is not possible to measure the Gas in Place with the information at hand in the Jalmat Field.

Q And yet you say that you have made a study that to you frankly correlates deliverability to reserves, without knowing how much Gas is there? In other words, if deliverability --

A Now, wait a minute --

Q -- is going to be your measure of reserves?

A Wait a minute -- I didn't say that. I correlated it with Recoverable Gas in Place.

Q In what manner?

A In what manner did I correlate deliverabilities and Recoverable Gas in Place in Jalmat?

Q Yes.

A I estimated the reserves for as many wells as I could, and

I estimated or calculated the deliverability from back pressure tests on as many wells as I could. I then took and made an analysis of that data.

Q But, sir, one more time, the method in which you estimated reserves was based upon, as I believe you replied a moment ago, but have not yet repeated, was based upon study of past performance?

A It was based upon the extrapolation of past production pressure performance of the individual wells, which is the only method available to an engineer of estimating Recoverable Gas in Place for most of the wells in the Jalmat Field.

It wasn't because that was necessarily the best, it was the only one available. I mean, it wasn't because that method was selected by choice, it was because that is the only method available to the engineer.

Q I see. But then you do not want to leave the impression with the Commission that deliverability in any way relates to Gas in Place, as we pointed out, there is not a single factor on the left and right side that enters into these two things?

A Well, I am saying this to the Commission in respect to the relationship between Reserves and Deliverability, and Recoverable Gas in Place in the Jalmat Field, that they are all three related.

Yes, sir, that in general the higher the Reserves, the higher the calculated Recoverable Gas in Place per acre, and the higher

the deliverability.

Q Did you state the higher the Gas in Place, sir? You said all three were related.

A I stated, the higher the calculated Recoverable Gas in Place.

Q That's one -- the higher the what?

A The higher the Reserves.

Q Wait a minute. What is the difference between the Recoverable Gas in Place and the Reserves under your definition that you submitted to the Commission?

A The Reserves are calculated through necessity for the wells.

Q Then, what is the Recoverable Gas in Place?

A Well, a well as such does not have Recoverable Gas in Place. It doesn't have Gas in Place as such, so to calculate the Recoverable Gas in Place, you have to divide the Reserves by an acreage assigned to the well, and that is the calculated Recoverable Gas in Place per acre that I have calculated from the Reserves; those three factors calculated in the manner I have just described, definitely related in the Jalmat Field in that they in general are hand in hand, the higher the Reserves, the higher the Recoverable Gas in Place, the higher Deliverability, and conversely, and the variations between Deliverability and Reserves are somewhat -- and Recoverable Gas in Place calculated as described cover approxi-

mately the same ranges, although the present allocation formula assumes that they are constant.

Q The Gas in Place on the -- could you answer this question "Yes" or "No", is Gas in Place a function of Deliverability?

A No, Gas in Place is not a function of Deliverability --

Q Thank you.

A -- as such, but that does not prevent, or circumscribe the fact that in the Jalmat Field the Recoverable Gas in Place and the Deliverability correlate with each other , and vary in a very similar manner.

Q That is your opinion?

A No, sir, that is my findings and conclusions based on a study of the Jalmat Field. I think if you will examine the relationship that I have tried to explain on Exhibit 7 and A, B, C, and D, it becomes quite apparent why that takes place in the Jalmat Field.

Q I have carefully examined them, sir, and finding neither a single factor that enters into both, I must conclude that if such a relationship exists, as you have stated in your opinion does exist, it must be a result of coincidence.

A No, sir; no, sir, will you not agree -- excuse me, that is not true, because --

Q We are speaking of Gas in Place?

A In each case, the factors that enter into both, if one increases, it increases both the Recoverable Gas in Place.

Q But not in the same proportion?

A No, not in the same proportion. I didn't say that the Deliverability and the Recoverable Gas in Place in the Jalmat Field vary in the same proportion, they do not, but they do vary over the same order of magnitude of extremes.

Q That is what your statement is?

A Yes, sir,that is the truth.

Q Did we actually tie down the answer, is that Gas in Place is not a function of Deliverability? I believe you have answered that once, but you went on.

A Well, they are not directly a function of -- that's true. Rigorously speaking, that is not true, although they are related. I have tried to show how they are related in theory, and I think that explains the fact as to why they are related in the Jalmat Field.

Q Well, sir, there is no use to continue the argument.

A All I'm saying is that a good well is good from both the standpoint of it's producing capacity, and it's reserves, and that a poor well is poor both from the standpoint of it's ability to produce, and from the standpoint of the amount of reserves it is going to recover, that is all I'm saying.

Q But you are not saying it is poor or good with relationship to the amount of Gas in Place on each unit assigned to that well?

A Yes, sir, I'm saying in general that is true; that a good well has a high Recoverable Gas in Place under the acreage assigned to it, and high deliverability, and that the poor well, the converse is true.

Q You keep saying "Recoverable", I presume you are familiar with that, and I'm speaking of Gas in Place.

A Well, as I explained, sir, I can't speak of Gas in Place because it is impossible to evaluate. I won't put it that way -- that the Recoverable Gas in Place can be evaluated with a great deal more certainty than the Gas in Place.

Q What would be the effect on this evaluation of a well workover that would greatly increase the deliverability?

A The effect on what?

Q What would be the effect on the Recoverable Gas in Place of a workover that greatly increased the deliverability?

A Well, in general, as I understand, as a general proposition, the higher the Deliverability generally the higher the Reserves, or of the Recoverable Gas in Place.

Q How about the Gas in Place?

A As I previously testified, the Deliverability, as such,

does not directly affect the Gas in Place, although they are related, and an examination of Exhibit 7 shows, I think, why they are related.

Q Well, we'll have to leave that to the determination of others. One final question. Mr. Howell brought up the question again of the thousand pound static well having gas migrate away from it to the five hundred pound well, unless there is a formula adopted such as you recommend, or similar, would it not more closely prevent that from happening if the formula were used which used static pressures, rather than this function, deliverability function?

A No, sir, my studies indicate that's not true; although on the surface of it, that might appear to be the case. Let me explain that. I have found that the calculated Recoverable Gas in Place varies about 90-fold throughout the Field, from one extreme to the other.

Q To what do you attribute that variation?

A Oh, it is a variation to the quality of the reservoir in the vicinity of the wells.

Q Can anything be done to the quality of the reservoir in the vicinity of the well, if the opportunity is given to the operator to recover his fair share of the gas?

A I am not sure which question you want me to answer. The first one, or the one you are now asking.

Q Either - they both lead to the same point that you have testified that the quality of the pay is affected by workover.

A No, sir.

Q In your examination from Mr. Malone, you said it wouldn't change merely the permeability unless restricted to his hypothet, but would change the quality of the pay and other things entering into it.

A What is the question, sir?

Q The question involved - Does pressure cause the flow of fluid through porous media, does pressure differential cause the flow? We'll break it down into several questions to get to the ultimate point. What causes flow of fluids through porous media?

A The pressure differential.

Q The pressure differential?

A Yes, sir.

Q You have stated that a formula involving absolute pressures from one well to another would not prevent migration as well as one using your deliverability, and you were going to explain that as to why you felt that that was so.

A Well, sir, may I take an example to explain that?

Q I would prefer if you wouldn't use the examples, if you can explain it in terms of physical processes I think it would be easier for everyone to grasp.

A Well, the reason I said that, is that in order to prevent that flow you have to equalize those pressures, and if the well with the higher pressure is assigned, the greater the allowable assigned to the well with the higher pressure, relative to the well with the lower pressure, the quicker will the pressures tend to equalize.

The 75%, 25 formula tends to give the higher pressure well a greater allowable, than if you allocated on say 100% pressure basis. That's why I have said that the recommended formula would tend to minimize that migration or flow from the high pressure to the low pressure, quicker than if you allocated on pressure alone.

Q On your pressure drawdown in your formula, it shows that that is the difference between the static pressure, and the flowing pressure, doesn't it?

A Yes,sir.

Q Then the actual pressure that is causing flow between wells is not involved in that formula, is it?

A The pressure difference causing the flow out of a well, that is between the shut-in and the working pressure, is different than the pressure difference between the wells causing migration in the reservoir, if that is what you mean, that is correct.

MR. DUTTON: Thank you.

MR. PORTER: We'll take a short recess.

(Recess.)

MR. PORTER: The meeting will come to order, please.

MR. WILLIAM WEBB: If it please the Commission, William J. Webb, representing Sun, Dallas.

BY MR. WILLIAM WEBB:

Q Mr. Keller, there has been considerable conversation yesterday afternoon and this morning about two gas wells, one on 160-acre tract, and one on adjoining 160-acre tract, the first of which has been completed without benefit of any stimulation, the second of which has been stimulated in some manner.

In your opinion, would the well which has been stimulated in some manner, would the ultimate Recoverable Reserves of Gas under that tract be greater than under the predication upon which there has been no stimulation performed?

A Yes, sir, in general, it would be my opinion that that would be the tendency by virtue of the fact that the higher deliverability resulting from the fracturing treatment would result in a lower abandonment pressure, and a higher recovery efficiency of the Gas in Place.

Q Therefore, there would be less waste of the Gas in Place?

A Yes, sir, when you increase the completion efficiency, you increase the recovery efficiency, and minimize waste, that is my opinion.

Q Under the Statutes of the State of New Mexico, is not the prevention of waste also a factor for the proration of natural gas as much as the protection of correlative rights?

A That is my understanding, yes, sir.

Q Have you made a study of the pressure differential in the Jalmat Pool on the various wells?

A Well, sir, I have made a study of the shut-in pressures of the various wells, but not specifically the differential between wells.

Q What is the range of that differential?

A The range -- I might first say I have also gone over 300 wells on which I had pressure data, a shut-in pressure data, which were taken primarily right around the first of 1957, and -- no, correction, this data is on 226 wells that I had data on, I found that the shut-in pressure varied on a minimum basis from 205 to 250 on a maximum basis, or about 5-fold variation.

Now, if we eliminate say the two extremes, the 10% of the wells with the lowest pressure, and the 10% of the wells with the highest pressure, and get the bulk of the wells in the middle, the pressure varied from 400 to 90 or a little better than 2 to 1. I believe those 226 wells are probably pretty representative of what the range in pressures are in the Field.

Q I believe you have heretofore testified as to your conclu-

sions as to the effect of that pressure differential on the recovery of gas. In your opinion, are correlative rights protected on a well which has the lowest of those pressures, it has the same opportunity to produce the same amount of gas as the well which has the higher of those two pressures? Are correlative rights protected as between those two wells?

A Well, sir, from my viewpoint, that would depend on what their relative recoverable gas is.

Q Assuming all other factors were the same?

A Well, in other words, if all other factors, aside from pressure, were the same then that would mean that the remaining recoverable gas attributable to each of the two wells would be in proportion to the pressures of the two wells, so it would then obviously follow that a hundred percent acreage, which would be if they were assigned the same acreage, which would be 1 to 1 allowable, under 100% acreage with a reserve of, variation of 2 to 5 to 1, so it would be my opinion,under those conditions that the correlative rights were not being protected.

Q In your opinion, does the formula which you have advocated before this Commission improve that situation in that it tends to a greater degree to prevent waste, and tend to a greater degree to protect correlative rights?

A Yes, sir, that is my opinion.

MR. WILLIAM WEBB: That is all.

MR. PORTER: Anyone else have a question? The witness may be excused.

MR. CAMPBELL: I have a little bit of re-direct, please. I would like, if the Commission please, to straighten up a few matters here that perhaps have left the record in doubt in a mathematical sense.

RE-DIRECT EXAMINATION

BY MR. CAMPBELL:

Q Mr. Keller, would you put those two things up on that board. Mr. Keller, in connection with your cross-examination by Mr. Hinkle, on one of the several hypothetical situations on which you have testified here, and also on a hypothetical question by Mr. Webb, you made some hasty calculations with reference to those situations.

Would you, by reference to the calculations you have put up there on the board, and referring first to Mr. Hinkle's hypothetical case of one well with a thousand pounds of pressure, and one well with five hundred pounds pressure, relate briefly to the Commission what your recalculations indicate as to that situation.

A Well, sir, I made some mistake in my calculations, both in respect to Mr. Hinkle's questions, and Mr. Webb's. I would like to correct them. I thought the easiest way to do so was to

set them down in black and white where they are clearly shown. The assumption under Mr. Winkle's question was that we had two wells, equal in all respects, except that the pressures varied. Number 1 had a thousand pounds of pressure, Number 2 five hundred, and then the problem was to calculate the deliverability, and the reserve under that assumption.

Correcting that yesterday, I testified that the deliverability would vary as three to one. Comparing the two wells, on calculating it in the quiet of my room, I calculate 3.2 to 1, while the reserve would be in direct proportion, or 2 to 1.

In addition, I have calculated the allowable that would be assigned to two wells under the assumptions involved on the recommended basis, and on the present basis, and I find that the allowable of the Number 1 well would be 2.2, compared to 1 on the Number 2 well, under the recommended basis and, of course, 1 to 1 on the 100% acreage basis, since the assumption was that all other factors about the two wells were equal.

Of course, it is quite obvious, I think, that the ratio of the reserves, or the ratio of the allowable, under the recommended formula of 2.2 to 1, is much closer to the ratio of reserves to 2 to 1 than is the 1 to 1 basis calculated under the present allocation formula. Actually, the 75, 25 basis was within about 10% of being directly, of the allowable being directly prorational to

reserves.

Q Now, with regard to the hypothetical case posed by Mr. Webb, I believe you, in your calculations, came up with a differential on the one thousand pound, two hundred pound cases of 67 to 1. Did you recalculate that?

A Yes, sir. I made a very large error in that calculation. As I recall, the assumption was similar to the one I just discussed, except that the pressures instead of being a thousand and five hundred, and with a thousand and two hundred in this case, all other factors about the two wells were equal, the question was, what was the relative reserves, and deliverability in the two wells under that example.

I testified that the ratio of reserve would be in proportion to the pressure, or 5 to 1, which is correct, and that the deliverability would be 67 to 1.

Now, I recalculated that, and that is in error. Actually with an N-value of 1, the ratio of the deliverability would be 25 to 1, but using the 8/10th slope that I have recommended N-value it would be 13.2 to 1.

I have then made some calculations to show the effect of that disproportionately between reserves and deliverability on the allocation on the 75, 25 basis; the ratio of allowable would be 4.6 to 1 in favor of the thousand pound well on the 100% acre-

age basis, it would be 1 to 1 and, of course, it is obvious under the hypothesis of these questions, that the 75, 25 which distributes 4.6 to 1, is much closer than the 5 to 1 reserve distribution than is the 1 to 1 basis here.

Although, I want to be sure that I am not creating a false impression that I'm claiming that the 75, 25 formula is near that percent in the Jalmat Field. It actually works out under this hypothetical situation to be a lot closer, I think, or somewhat closer probably than is reasonably possible in the field itself although the formula that I have recommended is the best formula I have been able to devise to allocate allowables as near as possible to reserves in the Jalmat Field.

Q Now, in connection with the Jalmat Field, you testified on cross-examination that you have concluded from your studies in the Jalmat Field, that this formula would approach, at least, the protection of correlative rights, closer than the present formula, and you have also testified, I believe, in the Jalmat Field that there is a relationship of sorts between the deliverability and the gas reserves.

Would you please state generally and briefly, what studies you referred to in your answer to those questions. What type of studies?

A Yes, sir. I evaluated the reserves for all of the wells

in the field for which I had pressure production trends that could be extrapolated in order to estimate reserves.

I found 265 wells with sufficient production history that I could estimate reserves on that basis. I had available back pressure tests on a little over 300 wells, where I had both the slope of the back pressure curve, and the open flow from which I could calculate the deliverability on the recommended basis of the flow against 50% of the shut-in pressure for each well.

I estimated the deliverability, or calculated it on that basis for approximately 300 wells.

Now, out of the 265 wells that I had reserve estimates on, and the 300 some odd wells that I had deliverability calculations on, there were about 226 wells that I had both deliverability results, and reserve estimates, and I have made comparisons between reserves and deliverability, employing that data.

Q Did you plot those on maps in the Jalmat Field?

A Yes, sir I did plot that map.

Q Would you get out those plots, please.

MR. LAYTON WEBB: I would like the record to show which Mr. Webb's testimony he is disagreeing with.

(Marked Texas and Pacific's Exhibits 8 and 9 for identification.)

Q (By Mr. Campbell) Mr. Keller, I would refer you to what

has been identified as Texas Pacific's Exhibit Number 6, and ask you to state to the Commission what that is.

A I have, on Exhibit Number 6, attempted to represent the relative distribution reserves in the Field, that I arrive at from the 265 wells that I was able to estimate reserves for by extrapolating pressure production information. The Exhibit Number 6 is a map of the Jalmat Gas Field area. I have taken the data on the 265 wells and arranged them in sequence of increasing reserves, that is, with the lowest reserves first, going up in ascending order of reserves to the highest.

I have then broken, or divided, those wells into four groups having an equal number of wells in quarters, so to speak. On that basis, I have found that the fourth of the wells having the poorest reserves all had reserves of less than 1.4 million, correction billion cubic feet per well. I have taken that poorest fourth and colored the acreage assigned to them on the map in dark blue; similarly for the second group of wells.

By that process, I found that the second best wells, the reserves vary from 1.4 billion per well, to 3.09, I have colored the acreage to these wells in light blue. The third group of wells being next to the best group, which have reserves ranging from 3.09 to 5.17, I have colored them in light red. For the best wells, which have reserves greater than 5.17 billion per

well, I have colored this dark red.

The result is that the better than average reserve wells, the acreage assigned to them, is colored in red on the map. The best half of the better half is in dark red, and the next to the best in light red. Conversely, with the less than average reserve wells are in blue, the poorest fourth of the wells being in dark blue, and the next to the poorest in light blue.

Q Will you refer to what has been identified as Texas Pacific's Exhibit Number 9, and state what that is, please, and explain it.

A Yes, sir. I have for each of the groups of wells, or each quarter, arranged in sequence of reserves, I have -- correction Exhibit Number 9 has been prepared by taking the 300 some odd wells that I have deliverabilities taken on, and arranging them in sequence of deliverability, starting with the lowest deliverability and going to the highest deliverability.

I have then divided those wells in fourths on a deliverability basis, and colored in the map on a deliverability map basis, in a similar fashion as I did on a reserve basis on Exhibit Number 8.

The result is that of those 300 wells, the wells that have less than average deliverability for the 300 are colored in blue; for the ones that have greater than average deliverability are in

red. I have further broken down just as with reserves, the better wells into the dark red and light red quarters and the poor wells from a deliverability standpoint in a light blue and dark blue.

Q Now, based upon that study, what is your conclusion?

A Well, sir, as I tried to explain from Exhibit 7, it seemed apparent to me that deliverability and reserves must be related in some fashion; that is, in general, the better the deliverability, the better the reserves, so I was attempting to testify that as applied to actual conditions in the Jalmat Field, and this was what I thought a reasonable method of analyzing to see if there was a correlation between the deliverability and reserves in general throughout the field.

I found that there was a general correlation, and I believe it shows up in a comparison of the reserve distribution and the deliverability distribution illustrated in the manner I have just described on Exhibit Number 8, and 9.

For example, it will be noted that on Exhibit Number 8, in the vicinity of Township 23 South, Range 36 East, there is a large red area of high reserves which correlates roughly with a large red area on Exhibit Number 9 in the approximate same location, showing the area of high deliverability. Similarly, we will notice that there is a high reserve and deliverability area indicated by the red in the north end of the Field, that there is a

fringe around the edge of this red area, designating the high reserve area; of blue colored wells showing lower than average reserves, which roughly corresponds to a fringe of lower deliverability wells on Exhibit Number 9.

There is also a rough correlation between the reserve distribution in the south 30 or 40 percent of the field. Most of the wells down there are poorer than average reservewise, with a few scattered better than average wells designated by red.

The same thing is true from a deliverability standpoint in the south end; most of them are lower in deliverability, with a few scattered wells of high deliverability. To my mind, this just illustrates that if you will take the actual data in the Jalmat Field, it is still true that good wells are usually good deliverability-wise, and reserve-wise, and conversely.

Q You can come on back down here now, please. You have stated numerous times that that relationship is not an exact relationship, have you not?

A Yes, sir.

Q First, will you state what your study reflected with regard to the ranges of difference in reserves and in deliverability in this field?

A Yes, sir. Let me say this, that as I previously testified, there were 226 wells that I had both deliverability and reserve

data on the same wells, so the comparisons that I am about to give you are confined to those 226.

I find that the reserves per acre varied 90-fold among those 226 wells. For my minimum of 8/10ths to a maximum of 91 million per acre. Now, that reserve per acre figure is arrived at by taking the estimated well reserves from the pressure production extrapolation and divided by the assigned acreage. The deliverability for those same wells varied from less than a hundred thousand per day to as much as about 19.4 million per day. That's a variation of 194.

Now, if we eliminate the extremes, both from a reserve and deliverability standpoint, and take -- eliminate the lower 10% and the upper 10%, and just consider the 80% of the wells representing the bulk of them in the middle, then the reserves per acre vary from 5.6 to 48.1, or a variance of about 8.6-fold. The deliverabilities on that same basis of comparisons vary from 360 thousand cubic feet per day, to 6.4 million per day, or a variation of 18-fold.

Q Does that wide variation indicate further to you that the allocation of allowables on the basis of 100% acreage does not serve to protect correlative rights?

A Yes, sir, it very definitely does, because regardless, under the present allocation formula, the acreage that has a

reserve of 73 million per acre gets the same allowable as the one that has less than one million per acre, so you have got a 73-fold variation, extreme variation, correction, 91 extreme variation in reserves, but the allowables are 1 to 1 per acre.

(Marked Texas Pacific's Exhibit Number 10 for identification.)

Q (By Mr. Campbell) Now, Mr. Keller, you have constantly stated here that your testimony as to the relationship between deliverability and reserve is not as to an exact ratio or portion. I refer you to what has been identified as Texas Pacific's Exhibit Number 10, and ask you to state what that is, and what it illustrates.

A Exhibit Number 10 is a graph on which I have plotted the deliverability in terms of M. C. F. per day, against reserves, in terms of millions of cubic feet per acre, calculated as I have previously explained for the data from the 226 wells on which I have both reserve and deliverability estimates.

Q What does that reflect?

A Well, sir, it reflects that there is a general trend or statistical trend relationship between reserves and deliverability. It reflects what I have attempted several times to explain today that they are not in direct proportion to each other, but there is a very definite statistical trend, which says in general that

increased reserves are accompanied by increased deliverabilities, and conversely. Not that one is the cause of the other, it is not a cause and effect relationship; it is just a general trend relationship, and it's illustrated by this trend in the grouping of the points.

To illustrate that trend a little more definitely, I have drawn a heavy dashed black line at this position on Exhibit Number 10, which is the Median of the data shown on this graph. It was arrived at in this fashion: You will recall I arranged the data in reserve order sequence, starting with the lowest to the higher, and divided them into four groups of equal number of wells. I have plotted the average deliverability against the average reserves per acre, resulting from that arrangement, and division into quarters, into red triangles, and have drawn, as you see, and it is a very definite straight line trend of that average data.

I have then taken the same group of wells, arranged them in an increasing deliverability sequence, spaces, taken average reserves and average deliverability after breaking up into those four groups, and plotted that average data that is, deliverability and reserves in general.

You will see that they both show a relationship, the average data does run in a little different direction; it's on that basis that I have attempted to average the trend of all of the data with

the dark blue line shown at this position on Exhibit 10.

Q Did this further substantiate your position, that deliverability entering into the allocation formula in some manner will serve to protect correlative rights more than the present formula?

A Yes, sir, because it tends to distribute allowables in conformance with a general relationship between reserves and deliverability. The present formula assumes that the reserves per acre throughout the Field are constant. My data shows that the variation in reserves per acre is up as much as 90-fold, so it seems quite obvious to me that the inclusion of the deliverability formula would tend to protect correlative rights more than straight acreage.

(Marked Texas Pacific's Exhibit Number 11, for identification.)

Q (By Mr. Campbell) Now, Mr. Keller, you have referred in your answer on cross-examination to the situation as to the Jalmat Field, particularly bearing out your proposal as to that Field. Have you made any comparison between these wells in the Field divided into fourths, as to reserves and the allowable under the present and the proposed formula?

A Yes, sir.

Q I refer you to what has been identified as Texas Pacific's Exhibit Number 11, and ask you to state what that is, and explain

it, please.

A Yes, sir. I took the 226 wells on which I had both reserve and deliverability data, and as I previously explained, arranged them in sequence of increasing reserves and divided them into four groups, with an equal number of wells, and which I have designated as 1, 2, 3, and 4 on Exhibit Number 11.

The number of wells in each group is also shown on Exhibit Number 4, under each of the bars on the bar-graph. There were 57 in the number 1 group, 56, 57 and 56 which is as near as you can divide 226 into four equal groups.

Then I have taken and calculated the average reserves per acre for each group, which I have designated by a red bar on Exhibit Number 11, which ties into the scale on the left hand side of Exhibit Number 1, for example, considering group number 1, the red bar reaching up to this portion correlating over to the scale, shows that the average reserve per acre for that first group of wells is approximately 6.4 million cubic feet per acre.

Going on up to the best group of wells, the highest group of wells, the average reserves per acre for that group is 46.8 million cubic feet per acre. Now, for each of the groups, I have also calculated the average deliverability which I have illustrated by the green bar. The lowest group, the average deliverability is 1.027 million cubic feet per day; for the best group is

about 4 million 577 cubic feet per day.

It will be noticed that when we divide the wells in this fashion, that it is just as one would expect,that in general the average, the fourth of the wells with the lowest reserves also have the lowest average deliverability, and that the two increase in the same direction although not at the same rate to where the highest reserve wells also have the highest deliverability, and as you recall, we also found out that they were distributed areally in that same type of relationship. Then I have, in addition, I have shown the relative allowable that each of these groups would receive under the recommended formula, and under the present allocation formula.

Q What is the result of that?

A The result of that is shown for the 100% acreage formula now in effect is shown by the heavy dashed line running horizontally across Exhibit Number 11.

Now, I might explain that this relative allowable as between groups, is relative on an acreage basis, to the average allowable for all four groups, so since 100% acreage treats each acre uniformly, and the relative allowable in terms of allowable per acre, the relative allowable for each group is the same. It's constant, that is, depicted by this horizontal line that the distributional allowable on the average to these groups would be constant on the

present formula.

I have calculated the relative allowable per acre by the way that is tied about the scale on the right hand side of the Exhibit 11 for the recommended formula. As shown, that formula results in assigning the group with the lowest reserves, and the lowest deliverability, the lowest allowable, which on the relative allowable scale is approximately 8.56% of the average per acre allowable for all four groups.

It also results in assigning the best wells reserve-wise and also which happen to be the best wells deliverability-wise, a higher than average allowable. In other words, the allowable distribution as illustrated on Exhibit Number 11, more nearly follows the distribution of reserves under the 75, 25 formula, than it does the distribution of reserves under 100% acreage, using all the data, data I have available to me on the actual reserves and deliverability in the Jalmat Field.

To my mind, it very definitely shows that the recommended formula will tend to distribute on the average the allowables more nearly in proportion to the reserves than does the 100% acreage formula. Actually, it might be criticised in that it doesn't go far enough in that direction. For example, considering the lowest reserve group with the highest reserve group, we find that the ratio of average reserves per acre, that is from 46.8 to 6.4,

is about 7.3 to 1.

The ratio of the deliverabilities is less than that on the average. It's from 4577 to 1027, or 4.5 to 1. The allowable varies from the best group of wells from a relative allowable of 1.59 to about .564, or a variation of 2.8 to 1.

So in summary, the reserves, the average reserves for these groups varies about 7.3 to 1. The deliverability about 4.5 to 1, and the allowable under the recommended formula about 2.8 to 1, while on the 100% acreage, it would vary as 1 to 1, the allowable would.

MR. CAMPBELL: I would like to offer Texas Pacific's Exhibits 8, 9, 10, and 11 into evidence.

MR. PORTER: Without objection, they will be admitted.

MR. CAMPBELL: That's all of the questions I have of this witness on Re-direct examination.

MR. PORTER: At this time, the hearing will recess until 1:30.

AFTERNOON SESSION - FRIDAY, NOVEMBER 15, 1957, 1:30 P.M.

MR. PORTER: The meeting will come to order, please. Mr. Campbell, I believe you have one more question?

RE-DIRECT EXAMINATION
(Continued)

BY MR. CAMPBELL:

Q The question has arisen, Mr. Keller, as to the point, if the Commission should see fit to include deliverability in the allocation formula for the Jalmat Field, what present basis would you use in arriving at the deliverability in the formula?

A Well, sir, I would recommend that each well in the Field be tested in accordance with the testing regulations included in the directive of the Commission dated March 15, 1954, and that the deliverability obtained from that test be corrected to the flow against 80% of each well's shut-in pressure, taken in conjunction with that test in accordance with the equations included in that March 15, 1954 directive.

MR. CAMPBELL: That's all.

MR. PORTER: Does anyone have a question of the witness?

Mr. Utz.

BY MR. UTZ:

Q Mr. Keller, are you aware of the fact that there has been more recent tests run on the wells in the Jalmat Gas Pool, namely, the four point back pressure test, which have been run in 1956, and are still coming in which could be used to calculate a more current deliverability, by using the individual well slopes?

A Yes, sir, Mr. Utz, I am. Those four point tests are the tests that I had available to me on these 200 wells that I have depicted on Exhibit Number 9, I believe it is.

The only difference between the use of those four point tests and my recommendation, is that, as I understand it, those tests have been spread over a considerable period of time. They are all not, as far as I could find out, all of the wells haven't been tested, and filed with the Commission, and I felt like that we could use that data to get at their average "n" value of approximately 0.82, and take a test survey on a one point base value, the wells at approximately the same time. I felt that might give a little more comparable data as to the deliverability of the various wells than the four point test.

Q It would take quite a length of time, however, to retest the wells, wouldn't it? Two, three, four months?

A That might be possible, it might be; well, I hadn't

MR. PORTER: Does anyone have a question of the witness? Mr. Utz.

BY MR. UTZ:

Q Mr. Keller, are you aware of the fact that there has been more recent tests run on the wells in the Jalmat Gas Pool, namely, the four point back pressure test, which have been run in 1956, and are still coming in which could be used to calculate a more current deliverability, by using the individual well slopes?

A Yes, sir, Mr. Utz, I am. Those four point tests are the tests that I had available to me on these 200 wells that I have depicted on Exhibit Number 9, I believe it is.

The only difference between the use of those four point tests and my recommendation, is that, as I understand it, those tests have been spread over a considerable period of time. They are all not, as far as I could find out, all of the wells haven't been tested, and filed with the Commission, and I felt like that we could use that data to get at their average "n" value of approximately 0.82, and take a test survey on a one point base value, the wells at approximately the same time. I felt that might give a little more comparable data as to the deliverability of the various wells than the four point test.

Q It would take quite a length of time, however, to retest the wells, wouldn't it? Two, three, four months?

A That might be possible, it might be; well, I hadn't

thought of that; it might be well to use the four point test at least until you could set up regularly scheduled annual one point tests. I don't have any objection to the four point tests at all; I think that the one point test is more desirable, as a matter of practical convenience, because they are easier taking -- easier to take one point test every year than four point test. I don't feel like some of the slopes on the four point test are not too reative, especially on the lower deliverability wells, because probably they may not be stabilized.

Q. These slopes do vary considerably, do they not, on the four point test that we're speaking of? The point I'm getting at is, would you recommend the use of an individual well slope, based on those four point tests, rather than averaging those slopes?

A. Well, I would certainly agree with you, Mr. Utz, that the four point tests, four point stabilized tests, would be a more accurate base for determining relative deliverabilities than the ones that I have recommended, and my recommendation was not for the sake of accuracy, but for the sake of practical expediency as to make -- not make the testing an unnecessary burden on the operations of the field.

MR. UTZ: That's all I have.

MR. PORTER: Mr. Dipple.

MR. DIPPLE: If the Commission, please, I'm sure that we are not the only ones that were somewhat surprised just before

noon when all these exhibits went up on the board. It was our impression that the applicant put on it's case last month. We have an entirely new case here now, and it is Continental's feeling that to undertake cross examination of this witness on the basis of these new exhibits would probably waste a lot of everyone's time, and certainly the time of the Commission, because it will be most difficult to conduct intelligent cross examination under the circumstances that confront us.

Now, I would like to say that Continental had intended to put on a very small amount of affirmative testimony in this case. I would be less than frank, if I didn't tell the Commission that after this new case that's been put on here this morning on re-direct by the applicant, we would feel, I would say stupid, to put on the testimony that we had planned on putting on. We are not prepared to go forward with it. I would move that the Commission continue this case until the December hearing, and that the operators be given an opportunity to study the testimony of this witness, and those exhibits that were offered here for the first time on re-direct this morning.

It is Continental's feeling that the Commission and the operators having spent a year and a half in trying to do the best thing possible for the Eumont Pool in finally writing the order that it wrote in instituting prorationing in that Pool, it is not unreasonable to ask that at least two months be spent in studying the revision of these rules.

I, therefore, move that this case be continued at this time until the December hearing.

MR. KINKLE: If the Commission, please, Clarence Kinkle, representing the Humble Oil and Refining Company.

We would like to join in the motion made by Mr. Dipple of Continental that the case be continued. I'm sure that Mr. Meiler has spent a good deal of time getting up the exhibits, perhaps several months. I think it would be unfair to ask the operators to analyse these exhibits in a few minutes, and try to check all the information from which they have been compiled.

I think it is only fair that, under the circumstances, that the case be continued, and rather than be continued until December, I think the Commission should, on account of the Holidays, consider continuance until January.

MR. MALONE: Ross Malone for Gulf. If the Commission, please, Gulf would like to join in the motion for Continental, we recognize that the Commission undoubtedly would like to get this matter disposed of, having devoted part of two monthly hearings to it, but as Mr. Dipple pointed out, we spent a year and a half working out the gas rules in Southeastern New Mexico. The thing that is proposed here now is a fundamental change in everything that was accomplished at that time. If that be true, it certainly seems to merit an opportunity for all parties affected by it, to present testimony which they have available.

I have to concur in the statement that the posture of the

case was very materially changed with the introduction of these exhibits on rebuttal, which go to some matters which we have had no opportunity to go into whatever.

I might point out that I spent part of the lunch hour here in an effort to analyse the two exhibits on the front wall. I found numerous cases of leases or units which were shown in light blue in reserves, and dark red in deliverability, and vice versa. How many of those there might be, and what the conditions which caused that may be, just aren't apparent now, and couldn't be apparent to us without an opportunity to analyse the exhibit, and develop the testimony that would be available on it. For that reason, we would urge that the motion be granted.

MR. DIFFIE: Mr. Chairman, if I may, in view of Mr. Kinkle's calling attention to the coming of the holidays, I would like to amend my motion to meet his suggestion.

MR. CAMPBELL: If the Commission, please, we regret having broken up anybody's lunch hour, or the holiday season, but this case, I think, was before the Commission, on our application for deliverability as a factor in the Jalmat Gas Pool for several weeks before the last hearing.

The last hearing, we advised everybody as to the recommended formula that we intended to propose. The same data that was available to Mr. Keller has been available to these other people to make their analysis of this field.

We commented last time, and I think appropriately, to a con-

tinuance of the case for 30 days to give everybody an opportunity to look at their hole card. Apparently that hasn't been done. If the next 30 days doesn't produce any more by way of cross examination than this 30 days, I can't see much point of continuing the case until January.

It seems to me, we have made a request here not only for deliverability as a factor, we have made a request of the Commission to cancel underage as of June 30th, which I think they were obligated to do, redistribute it to the wells in the field by the proration period, in order to get the credit for it.

To go into the next proration period, and have to be shut in, credit, that kind of a thing, as far as we are concerned, if the Commission sees fit to do it, it shouldn't wait until January because it has a considerably different effect to do it in January, in the next proration period, than it does during this proration period.

I'm going to have to resist the request for continuance of this case. The people involved here were aware of the fact this application was for the Jalmat Gas Field. I'm sure that Mr. Keller stated last time, and he has stated repeatedly here today, that he has made a study of the Jalmat Gas Field; all those other operators are in that field, and have the same opportunity to make that type of study, if they see fit.

If they have witnesses who could testify in support of the allocation formula, they have had ample time to make them available to the Commission at this hearing.

MR. KELLY: John Kelly. If the Commission, please, last month I called the Commission's attention to the fact that the testimony and side remarks by examining attorneys and other witnesses through the scope of this hearing were far beyond the Jalmat Gas Field.

In fact, it is a basic proration hearing for gas in Southeastern New Mexico, and that the Commission would probably be faced, if they rendered a decision, no matter what the decision is, in the Jalmat Field, with having hearing called in the Eumont, the Tubbs, and the other gas fields in Southeastern New Mexico.

I suggested at that time that the Commission, on their own motion, should advertise a hearing.

MR. PORTER: Mr. Kelly, I believe you are out of order here, since we already have one motion before the Commission.

MR. KELLY: I haven't introduced a motion.

MR. MORGAN: Are you speaking on the motion?

MR. PORTER: This particular motion, or the one that you made last month?

MR. KELLY: I'm speaking on this one, and adding mine into it.

MR. PORTER: Mr. Kelly, if you are speaking on this motion, why you are in order, but if you bring something else into it, you are not in order.

MR. KELLY: I'm not an attorney, I am a lone, and independent operator, I haven't these big staffs. The motion was to continue the Jalmat case. Let me say, I will concur in that, and then

can I point out some side factors to the Commission?

MR. COOLEY: Do you have some reasons why you think the motion should be granted?

MR. KELLY: I have some reasons especially the morning the Permian Basin got up and talked about Eumont; if I'm out of order, he was out of order, talking about Eumont this morning.

I would like to point out to the Commission right now, that gas prorationing between the Eumont and Jalmat Field for the first eleven months of this year, that you have allocated 180 million M.C.F. to Jalmat, and 119 to Eumont, out of the same reservoir. As he pointed out this morning, approximately 65%. But anyway that is only one of the problems that is going to face the Commission.

I would like to point out to the Commission, while Mr. Hipple has the motion for continuing this case. I will concur in continuing this case, but I would also like to request the Commission to issue on their own order, covering all gas proration, and if they so desire to add the Jalmat case into the over-all problem so we can talk about the whole problem at this time, and make a decision, because this is a basic gas proration problem, as pointed out. It took us 18 months to get to the decision we have right now. I don't think we want to spend 18 months going through each individual field to reach a decision in each case, when we can do it in one over-all call of the Commission.

MR. WEBB: Layton Webb of Sinclair. If it please the Commission, Sinclair would like to join in Continental's motion, and

concur in the motion of continuance of the case, and further, I think Mr. Hinkle's suggestion was a good one, if the Commission should see fit, that it be continued to after January the first, because of the Holidays, and also that might give us a chance to see what is going to happen when we actually cancel out these underages, and apply that to the over-produced wells in the field.

MR. HOWELL: Mr. Porter, Sam Howell, representing El Paso Natural Gas Company.

El Paso Natural Gas Company would like to proceed with the case and get the matter determined. The question of deliverability which seems to be the thorny one in the application is not a new matter in relation to the Jalmat Gas Field, because the record of the initial hearings are replete with testimony offered, I think, both by Southern Union, Permian Basin, and El Paso, pointing out the advisability of including deliverability in a factor.

Perhaps we are now reaping the consequences of not having done it then. I believe all operators have had an opportunity for some two and a half years to make such studies as are necessary, and El Paso would like to get the matter settled at this time, if it can be so settled.

MR. PORTER: Mr. Dipple, since the motion is yours, I will direct the question to you: The Commission would like to know in what respect your company and the others which concurred in your motion, feel that they have been surprised, and to what extent they feel new evidence has been introduced in this case on Re-direct?

MR. MEYER: You have added some exhibits here that certainly change the complexion of the case completely. All you had in last month's testimony on behalf of the applicant was a bunch of generalizations, and just as Mr. Malone pointed out in his rather quick glance at the exhibits back there, he could see some problem areas that need some specific study.

I don't mean to imply that there is anything up there that is being misrepresented, but we need to have an opportunity to examine these exhibits carefully, and see what they do purport to depict.

Frankly, Continental would like to be furnished with the deliverability figures that Mr. Keller used in working up these exhibits here. Wherever he got that information, we would like to have that source of information made available to us. We would like to have copies of these exhibits and we would be happy to pay the cost of them, but while the exhibits that were offered here this morning do go to the question that they have raised in their application, they are now getting specific about certain things that they only generalized before, and we were led to believe, perhaps we are too naive, but we were led to believe last month that they had put on their case. I don't believe there is a lawyer or layman in this room today that believes that they put their case on last month. They put it on in the last 30 minutes this morning.

We ought to have an opportunity to examine it. The recommend-

ations they are making, as was pointed out by several of those who have appeared in our motion, go to the very heart of gas prorationing in the Jalmat Pool, and it's just simply too serious a matter, we believe, to take just pot-shots at it, is all that we could do this afternoon, or if we worked tomorrow and Sunday, we would have to spend entirely too much time by way of cross examination to inform ourselves of what is being shown on these exhibits.

MR. PORTER: We will take a short recess.

MR. PORTER: The meeting is in session. The Commission has decided to deny the motion for continuance either to December or January. We will recess at this time, and reconvene tomorrow morning at 8:30, in order to try to dispose of this case.

SATURDAY MORNING SESSION, NOVEMBER 16, 1957, 8:30 a.m.

MR. PORTER: The meeting will come to order, please. Anyone have a question of Mr. Keller?

MR. KALDER: May it please the Commission, for the record, my name is Rose Malone.

The representatives of the companies operating in the Jalmat Pool who feel that the Commission's present rules for gas prorationing in that pool are adequate and should be retained in their present form, met during the recess yesterday afternoon to work out plans for taking advantage of the recess granted by the Commission. During the period of this meeting, engineers of several of the companies were engaged in an attempt to analyze

the exhibits presented by the applicant as rebuttal evidence to determine whether or not we could agree as to the correctness of the exhibits, and the conclusions which Mr. Keller has drawn from them.

The further purpose of the operators meeting was to attempt to have duplication of cross examination in connection with exhibits by making it possible for one or two attorneys to ask all questions which any companies may desire to ask the witness. The operators who were represented at the meeting, and who concur in this statement, and have requested that I make it in their behalf, are Continental, Humble, Gulf, Skelly, Atlantic, Pan-American, Tidewater, Sinclair, Amerada, Shell, and John Kelly.

It was a unanimous conclusion of the operators who support this statement that the exhibits presented by Texas Pacific Coal and Oil Company as rebuttal evidence, and the testimony supporting them, injected new questions into the hearing, which had not been raised by the testimony and exhibits in their case in chief, they took the operators supporting the present rules by surprise, and those operators feel that they are not now prepared to meet and could not be prepared to meet those questions until their engineers have had an opportunity to analyze the exhibits in detail.

The operators realize that the Commission has listened very patiently to extended cross examination of Mr. Keller in this case already. It was their view that this cross examination should only be further extended, if it was felt that to do so would

materially contribute to the solution of the questions raised by these exhibits. The magnitude of the information on which these exhibits are based, relating to reserves and deliverability figures of 224 wells in the Jalmat Pool, and the impossibility of immediately analyzing the effect on these exhibits of the arbitrary grouping of wells by Mr. Keller, and preparing them in the presence of the operators made further cross examination of this witness at this time and under these circumstances, an unjustified imposition upon the Commission.

The operators who join in this statement have therefore authorized me to say that under these circumstances, they will direct no further cross examination of Mr. Keller.

It is the unanimous opinion of these operators, however, that affirmative evidence by qualified witnesses, based upon the same type of study, detailed study, that has been made by Mr. Keller, and studies to show the effect on these exhibits of the arbitrary classifications and exclusions of wells on which the exhibits are based, would be helpful to the Commission in evaluating the evidence, and in resolving questions that are presented by this hearing.

These operators, if afforded an opportunity to do so, will come forward with their own witnesses to present such evidence, the need and importance of which appeared for the first time when these rebuttal exhibits were admitted in evidence.

It is apparent that substantial property rights will be affected by any action of the Commission in this case, and that with

out an opportunity to prepare and present affirmative evidence in the light of these rebuttal exhibits, they will not have been afforded a fair opportunity to protect their rights, or to aid the Commission in reaching the best possible decision in the case.

For the reasons stated, the operators who joined in this statement, respectively, move the Commission to permit the record in this case to remain open until the January meeting of the Commission, and to afford them an opportunity at that time to present affirmative evidence in the case.

I would like to close this statement by saying that this statement and motion are made by these operators in the very best of spirit, and with full consciousness of the problems that face the Commission, as far as this hearing and the heavy docket of the Commission is concerned. We appreciate the Commission's having afforded a recess yesterday afternoon to try to analyze these exhibits, and we appreciate the Commission's willingness to come down here on Saturday morning to try to help get this case disposed of. We hope that if afforded an opportunity to do so, the affirmative evidence, without which we do not feel that the record in this case will be complete, that we will have an opportunity to prepare and present that evidence to the Commission for the assistance which we feel that it would be.

MR. CAMPBELL: If the Commission, please, I would like to clarify one or two points in connection with this statement.

In the first place, these exhibits are not offered in rebuttal

al; they are offered in the case in chief on Re-direct examination. I felt when they were presented, and I feel now, that it was proper Re-direct examination.

The questions raised by the cross examination constantly referred to the relationship between deliverability and reserves, and raised questions as to whether those relationships existed in the Jalmat Gas Pool.

The Jalmat Gas Pool has been the subject of this hearing ever since the application was filed. This witness testified in the first hearing that he was making exhaustive studies in the Jalmat Gas Pool, and it seems amazing to me that people would not expect that studies would be made sufficiently to relate deliverability and reserves in this field and be prepared at this time to offer affirmative evidence in their own case in support of their position.

I don't think that I have ever before this Commission been arbitrary in trying to put anything past the Commission on the other operators. This is just another case where the operators are not prepared to offer their evidence at the time the case is called.

As I stated yesterday, there are certain aspects of this case that we feel have important relationship to time deliverability, as far as that part of it is concerned, conceivably may not be one of these things in so far as the end of the year is concerned. There are other aspects of the case that do have an important relationship in point of time, as far as the applicant's position

is concerned in this case.

I do not like to be arbitrary about it. I do know that there were some of the operators listed in the protest that did not request the exhibits from the last hearing until ten days before this hearing. If this matter is of such great concern, and it occurs to me that the time that has elapsed since the filing of the application gave, anybody who wanted to had the opportunity to make the same studies that Mr. Keller made, or any other studies they saw fit to make.

MR. MACHE: May I, in that connection, suggest that my statement as the Commission, and certainly Mr. Campbell knows, that I did not say and did not intend to imply, that there was anything improper in the exhibits that were offered. I did state that we felt they required analysis before we could properly testify to them, or take a position on them.

But, it occurred to me, Mr. Campbell pointed out that the deliverability and the proration formula were matters that were, I think he said, conceivably of urgency requiring immediate action by the Commission. That is the aspects of this case to which the statement was directed, and it is the matter to which these exhibits that are causing the concern are directed. The remainder of the case, which as I understand relates to the consolidation and redistribution of allowables.

I think I should state frankly to the Commission that that matter was brought up at the meeting yesterday afternoon, and the

operators could not agree on what Texas Pacific was requesting in that regard. There was no understanding either general or specific as to exactly the relief that Texas Pacific was requesting. It was the feeling that that was not clear from the evidence.

I don't know whether there is any objection to that portion of their relief, because we couldn't agree on what that portion of the relief was. I think if Texas Pacific would state, maybe they have stated it, and stated it clearly, but for the twelve or so operators that were involved, there were no two that had the same understanding of the application.

Conceivably, if that would be clarified, and the individual operators could make a statement of their position on it, that portion could be taken care of and that problem that we consider to be a major problem, and one that justifies further consideration by the Commission as to what the proration formula should be, could be taken up after the first of the year.

I think it would be helpful to the operators if Texas Pacific would clarify what they want in that regard.

MR. CAMPBELL: Does the Commission want that again?

MR. PORTER: Yes, sir.

MR. CAMPBELL: We have asked the Commission immediately to take the action which we feel was required under a prior order of the Commission on June 30, 1957, by cancelling accumulated underages at that time, and redistributing them among all the wells in the Jalmat Gas Pool, according to the Commission rules which

would result in the reallocation of the allowable in the over-produced wells, and make it possible to move into the next proration period where they are not over-produced, where they will be required to be shut-in after the first of the year.

MR. MALONE: To try and clarify and be sure we have a clear understanding of it, how would that affect production by under-produced wells, since June 30th, 1957, which has already been made up as legal production?

MR. CAMPBELL: That would not affect that, Mr. Malone, that I know of. You mean the production that has been made up since on the status at the end of June 30th, 1957?

MR. MALONE: Yes, that has already been produced.

MR. CAMPBELL: Well, I presume the Commission has treated that as legal production, because they permitted that order to be extended in some manner which I don't understand, but they permitted it to be extended in some manner, and it was legal production. I don't think that can properly be cancelled.

MR. MALONE: That was one of the big problems in the discussion yesterday, was that the operators agreed with you if it was legal when produced, it couldn't be cancelled.

MR. McCARTHY: Permian - Pat McCarthy.

MR. COOLEY: State your name, please.

MR. McCARTHY: Pat McCarthy, Permian Basin. This suspense order of July, 1957 is to run until January of '58, and that there can be no cancellation of underages prior to that period.

It's position is that the application in this case is, in effect, a collateral attack on that order. We believe that if the applicant was unsatisfied with the order, it should have taken a proper appeal, instead of coming in here collaterally.

MR. CAMPBELL: I'll admit that order put by me in June, 1956, but the extension of it, I never had an opportunity to object to that. As I read the order, it expired by it's terms on June 30th, 1957. I can't see any justification to extend it beyond that time. Of course, there is in that accumulated under-production a large amount of under-production that had occurred as of January 1st, 1957, where they had the six months to make it up, up to June 30th, 1957.

Even the cancellation of that portion would be of some benefit to the imbalances in the field at this time.

MR. COOLEY: Mr. Campbell, in the light of your remarks, it is your opinion that any production, under-production, which has been made up during this suspension must be considered legal production? What advantages is there to be gained for going retroactively back to June or July 1st, rather than --

MR. CAMPBELL: Waiting? It would be my feeling that although I haven't checked the figures, that that under-production that may not have brought the thing completely into balance. I know it hasn't as to some of the over-production. I understand that under-production is continuing to build up.

My only feeling about doing it at this time is that our concern about this balancing business lies in the effect of the

last two months of the proration period, and in the fact that you go into new proration period with the obligations involved in that in an unrealistic exaggerated condition.

If you wait until January first, you are going to have a larger number of this field, and probably have these people who are asking for a delay here, are in the same position, that are going to have to be shut-in for varying periods of time despite what is trying to be done to bring the wells into balance.

If you re-allocate the under production now, at least as to some of these wells, it will avoid shutting them in, or at least shorten the period of time during the next six months when they would have to be shut-in. That is the only reason we would have for that request. The end result that we have in January, as to the amount of under-production redistributed, would be essentially the same.

MR. COOLEY: It is my understanding of these redistribution rules that no over-produced well would be shut in until it has received it's portion of the redistribution?

MR. CAMPBELL: That is correct, but maybe that isn't sufficient to avoid it being shut-in, but -- and also it might make it possible for that well to be produced during the next month or two, over-produced in this proration period, which would give it another six months to make up if it could be gotten into balance now in that method, than it would be in balance for this period.

MR. HOWELL: Ben Howell, representing El Paso Natural Gas. We are concerned with the prospects of going into another proration period with this and other pools in the condition in which

they exist, and with the possibility of the shutting in of wells whose production is needed to meet the market demand.

We expect to put on evidence in this hearing to show that the effect of the proration rules as now adopted in the formula, as now applicable which excludes deliverability as a factor, has been to deprive Lea County of a substantial portion of market. We face the possibility of having to run in here with emergency orders to meet any unusual conditions that may arise, unless there is a realistic approach and an allocation of the gas allowables to the wells that can make the allowable, which hasn't been the situation in the past; so that from our standpoint, we think that to continue any portion of the case until January would be merely increasing the state of inbalance, and creating a situation that would be harder to cure then than it is now.

We would like to go ahead and have the matter disposed of.

MR. GURLEY: Do you concur, Mr. Howell, in the position that there would be some advantage to be gained by these over-produced wells, if we were to go back and retroactively redistributed as the applicant requests?

MR. HOWELL: I think that a redistribution-certainly we have felt and stated that a reclassification of a number of wells to a proper classification as marginal wells and redistribution which I think clearly can be done administratively, will give some relief. It will certainly give that double-barreled relief that we have been talking about in that it not only redistributed accumulated under-production, but prevents the allocation of future

allowables to the wells that just wouldn't make it in the winter period when pipeline companies are looking forward to urgent demand for gas at the time they need it.

If we are too have another February, such as we had in 1956, with the present status of this pool, in the absence of emergency action, why the major supply of our gas would be shut off, because the wells we would have to make it from would be shut in.

MR. COOLEY: I appreciate the facts that you have just mentioned, but I don't believe that answers my question. You realize that the classification of marginal wells would afford considerable relief. What is your position on this matter of retroactive redistribution of underage accrued to non-marginal wells?

MR. HOWELL: We would be glad to concur if it is legal and possible to do so under the existing situation. I don't know the answer to it; frankly, if it can be done within the framework of the law.

MR. COOLEY: That is precisely what I am trying to get at. Do you think it can be done under the framework of the law?

MR. HOWELL: I won't say it can't be done. I would be happy to see it done if it can be done under the framework of the law. Is that a clear statement of your position?

MR. MALONE: If it please the Commission, in that connection, I don't know if it would add anything to the solution of the problem. I think this should be suggested. I would imagine that in all causes of truly marginal wells, no operator would have any

objection to reclassification, and reallocation of allowable because of the fact that the reclassification is going to involve some wells that are not marginal, but have not produced their allowable because the Pipeline couldn't take it. It seems to me that an opportunity is going to have to be afforded for anybody having such a well to come in and ask that it's allowable not be cancelled because it has the ability to produce it, and now has the market to produce it, but with the exception of wells in that category, this cancellation, it seems to me, would not be objectionable, and might effect some immediate relief as has been suggested.

MR. CAMPBELL: I have to clarify one more thing. I think I may have given the impression that we weren't concerned at all about the time element on deliverability. That certainly isn't the case. We have the firm opinion that we have stated frequently at this hearing, unless something of that sort is done, we don't think the proration system in the Jalmat Pool will ever work. We think that is one of the possible solutions, if the Commission insists on continuing proration in this pool. The quicker that that is recognized and becomes a factor, the less severe is going to be the effect of what has occurred in the past two and a half years.

We certainly don't want to leave the impression that we are just bringing this up to give a year or two to consider it. We have been considering it, and I think everybody recognizes, if they are realistic about it, it has been a possibility ever since gas proration was considered, or the Commission wouldn't have been requiring testimony. It isn't as much of a surprise as some people

have indicated.

My point was that on the face of it from the time point of view was not as significant. If the Commission feels that the people are being abused by the approach we have taken here, I am not going to be obstinate about it. I don't think they have. I think they have had the same opportunity we have had to look at their picture, and the picture in this pool.

MR. MALONE: If the Commission, please, on that particular phase of it this is the way it appears to me. There might be some legal question as to the effect of cancelling this underage even as of December 1st, under that 30%, which somebody might be entitled under this order to have made up this production.

The problem to us is that the purchaser though he wants to buy gas in December, under the present rules is unable or reluctant to do it, because he is required to show the Commission at the end of December that he is in balance as to that well.

Now, if he was able to calculate, the Commission would let him do it, the status of the well as of December 31st, then it seems to me that he could do the same thing, but there is some question apparently under the rules whether he can do that. In other words, if he could show the Commission that the well would be in balance as of December 31st, and he can go in and over-produce that well, and in the last proration period, and he would have the six months to make up the unbalance, I wouldn't want to, or request the Commission to, enter an order here that would deprive anybody of what they are legally entitled to, as far as making up under-production is concerned.

particularly since it has been recognized for the first five months, I wouldn't want to throw the whole thing into litigation on that basis.

It seems to me that something could be worked out where the purchaser would be assured that he would not be violating the rules by over-produced wells in this proration period in this. It doesn't make sense to me that the purchaser wants to buy, and we want to sell, and he cannot get it. That just doesn't apply only to the applicant.

MR. WOODRUFF: Norman Woodruff, representing El Paso Natural Gas Company.

The net effect of cancelling on January 1st, or on December 1st, would be the same, because the producer would have additional allowable assigned to the well, which would be considered to be assigned during this current six month period. There is one advantage to having it assigned earlier, because it enables the product and the pipeline company to know that the well will be in balance by the end of the year.

Your present rules require this, for example if it took one day in December to get in balance, just shut in for one day, the operator and the pipeline company must prevent the well from over-producing during the balance of the month, so that they will show an end of month status in balance. In other words, to make up the one day over-production, you have got to maintain in balance during the rest of the month, and not be able to over-produce, that would be the additional flexibility that we would get as I see, by doing it now.

If we could go back to the old approach that the Commission took prior to condition that we now have where the Commission assumed that the well was in balance during any one month that it has a positive net allowable.

Now, by that I mean that it has more allowable assigned to it during that month than it's accumulated over-production, so by operating the property during the month, the operator could get it in balance. The Commission did assume prior to the change in the rule, that that could be done. If an exception could be granted for this particular period so as to permit that to be accomplished, it would give the same flexibility as cancelling underage, and redistributing at this time, rather than on January 1st.

MR. PORTER: In other words, Mr. Woodruff, as long as your current allowable exceeded the over-produced status of the well, it would not be considered over-produced?

MR. WOODRUFF: That is correct. You would consider that the operator could get in balance during that month.

MR. PORTER: Has that changed by order R-967?

MR. WOODRUFF: I believe that is correct. It is the most recent order pertaining to proration for the whole of New Mexico.

MR. PORTER: Mr. Utz, what are the rules for it in the end of the balancing period at the present time?

MR. UTZ: If there is overage less than the current month's allowable, it is ordered to curtail during the month the amount that will show in balance at the end of the following month. If there is more than the current month's allowable, then it is

ordered to shut in for the entire month. It is required to show a balanced condition at the end of the six months.

MR. PORTER: At the end of one of the six months?

MR. UTZ: Yes.

MR. PORTER: Whereas we could carry the production all the time?

MR. UTZ: Prior to that, apparently we were only assuming that he would be able to get in balance. He might never get in balance.

MR. PORTER: We will have a short recess.

(Recess.)

MR. PORTER: The meeting will come to order. The Commission has decided to deny the motion for continuance to January.

The Commission is willing, however, to continue the case to November the 25th, and at this time hear any testimony that anyone wishes to introduce during this session.

We are, however, willing to continue the case until November 25th after the testimony is heard, if anyone so moves.

MR. MALONE: I'm sure that the Commission has taken into consideration that the New Mexico Oil and Gas Association is going to be meeting here on the 25th and 26th, has it not?

MR. PORTER: We are conscious of that.

MR. MALONE: May I have just a moment, if the Commission, please?

MR. PORTER: Go ahead.

MR. MALONE: May it please the Commission, in a hurried canvass of the representatives of the companies for whom I undertook to speak, the consensus seems to be approximately this: It's

the feeling of the operators that that time would not permit the preparation of what they feel the Commission should have in considering this case nonetheless, they would be willing to return to their offices and work continuously next week, which is what that would amount to, and present whatever they have been able to prepare within that week, but this practical problem arises. Hotel rooms are wholly non-existent in Santa Fe at that time. They just can't be had for love or money.

Mr. Winkle is the chairman of the Public Lands Committee of the Oil and Gas Association, and has to attend a meeting that day. I have a case in Eaton which I cannot be excused from, and cannot be present. There are other persons with commitments for that time also.

If the Commission could possibly shift that just a few days to where we could get hotel reservations, and avoid that conflict with the Oil and Gas Association, we will come back and present everything we have been able to prepare within that time. Unless it can be changed, we do not feel that we can make the motion suggested, for those reasons.

MR. COOLEY: Mr. Malone, is December 9th satisfactory with your group?

MR. MALONE: I think that would be a good date.

MR. PORTER: That would be on a Monday.

MR. COOLEY: Permit me to make this motion, because it must be coupled with a motion for an interim order.

MR. MALONE: Thank you.

MR. COOLEY: I would like, then, to move the Commission

to continue this case until Monday, December 9th, 1957, and in conjunction therewith, to enter an interim order granting an exception to the Jalmat Pool rules, for all wells in that pool, to the effect that any well in the Jalmat Pool which has an over-produced status during any month, less than the current allowable for the month, be considered to have been in balance during that month.

MR. PORTER: Any question as to clarification of counsel's motion for the interim order?

MR. HOUSTON: Is that since the beginning of proration?

MR. COOLEY: No, sir, just during the current six month proration period.

MR. HOUSTON: Since June 1st?

MR. COOLEY: July 1st to December 31st.

MR. PORTER: Any objection to the motion? Now, this still does not preclude any testimony being presented today, if anyone desires to do so. Mr. Howell.

MR. HOWELL: Mr. Porter, we have testimony, but in view of the hour, the weather conditions, and the difficulties in returning home for some of us, I think we will reserve our testimony until the December 9th meeting. We will be free to offer it at that time, as I understand?

MR. PORTER: Yes, sir.

MR. HOWELL: The meeting will be continued?

MR. PORTER: If no objection to Mr. Cooley's motion, the case will be continued to December 9th at 9:00 o'clock a.m., and an interim order will be entered.

CERTIFICATE

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

WE, ADA DEARNLEY AND MARIANNA MEIER, Notaries Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached transcript of Hearing before the New Mexico Oil Conservation Commission was reported by us in Stenotype and reduced to typewritten transcript by us and/or under our personal supervision; the same is a true and correct record to the best of our knowledge, skill and ability.

WITNESS our Hand and Seal, this, the 5th day of December, 1957, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Ada Dearnley
Notary Public

My Commission Expires:
June 19, 1959

Marianna Meier
Notary Public

My Commission Expires:
April 3, 1960.